DEPARTMENT OF THE AIR FORCE

AIR UNIVERSITY

AIR FORCE INSTITUTE OF TECHNOLOGY

2

AFIT/GEM/LSM/88S-18

EVALUATION OF THE AIR FORCE AS A DESIGN AND CONSTRUCTION AGENT IN THE MILITARY CONSTRUCTION PROGRAM

THESIS

Brian H. Sekiguchi

AFIT/GEM/LSM/88S-18

The contents of the document are technically accurate, and no sensitive items, detrimental ideas, or deleterious information is contained therein. Furthermore, the views expressed in the document are those of the author and do not necessarily reflect the views of the School of Systems and Logistics, the Air University, the United States Air Force, or the Department of Defense.

Accession For	
NTIS GRA&I	X
DTIC TAB	☐
Unannounced	☐
Justification	
By	
Distribution/	
Availability Codes	
Dist	Avail and/or Special
A-1	

QUALITY INSPECTED 2

AFIT/GEM/LSM/88S-18

EVALUATION OF THE AIR FORCE AS A DESIGN AND CONSTRUCTION AGENT IN THE MILITARY CONSTRUCTION PROGRAM

THESIS

Presented to the Faculty of the School of Systems and
Logistics of the Air Force Institute of Technology
Air University
In Partial Fulfillment of the
Requirements for the Degree of
Master of Science in Engineering Management

Brian H. Sekiguchi, B.S.

September 1988

Approved for public release; distribution unlimited

Preface

The need to effectively manage the Military Construction Program (MCP) is a distinct economic reality. During the 1980s, funding for the Military Construction Program has exceeded $1.5 billion annually. This necessitates the need for good, effective management to avoid the common problems that presently plague the MCP process.

This case study researches the actions taken by the civil engineering organizations at Moody AFB and Kirtland AFB in assuming the design and construction agent responsibilities from the U.S. Army Corps of Engineers.

I would like to thank my advisor, Major Hal Rumsey for the guidance and direction he provided. His patience and encouragement were crucial in the preparation of this thesis. I am thankful for the support of the civil engineering organizations at Moody and Kirtland AFBs; and I am especially indebted to Captain Ed Taylor and Mr. Wes Furman for their assistance during my visits. I want to also thank Ms. Jonna Lynn Caudill for her valuable help in putting this thesis together.

I am thankful for the friendships I have made during my stay here in Dayton. Captain Neil and Tamara Whiteman and Captain Tracy and Judy Willcoxon and their families provided the common support which made the work bearable.

Finally, I wish to express my deepest appreciation to my wife, Jerri, for her patience, understanding, and support through this entire academic endeavor.

Table of Contents

List of Tables

List of Figures

AFIT/GEM/LSM/88S-18

Abstract

The Military Construction Program has long been criticized for the myriad of problems stemming from its complicated, inter-organizational process. These problems hinder the effective management of any MCP program in the Air Force. This case study examines two Air Force civil engineering organizations managing MCP projects in lieu of the U.S. Army Corps of Engineers. The research objectives were to develop a performance measurement system for MCP design and construction activities and then to evaluate the Air Force managed MCP programs.

The results indicated the Air Force MCP programs at Moody AFB and Kirtland AFB were more effectively managed than earlier programs by the U.S. Army Corps of Engineers. Cost savings, increased responsiveness to users, improved facility design and architectural compatibilty, lower contract modification rates and the ability to incorporate changes more easily to accommodate mission change were some of the advantages found in the Air Force managed programs.

Some of the key management initiatives responsible for the successful program at both organizations included the following: establishment of an independent MCP Management Office, collocation of contracting personnel with engineering personnel, hiring of technical expertise,

cradle-to-grave project management and the employment of the team concept with a multi-disciplined engineering staff to manage projects.

Both Air Force civil engineering organizations used these well-coordinated management decisions to effectively manage the MCP program. Significant improvements were identified in the following historical MCP problem areas: 1) customer satisfaction, 2) reviews/changes, 3) project turnover/warranty, and 4) quality of work life. The experiences at Kirtland and Moody AFBs proved that with increased involvement of the user and the base civil engineering organizations in the MCP program, "pride in ownership" of the facilities constructed also increased. This resulted in a better product--a functional, well-designed and cost effective facility.

EVALUATION OF THE AIR FORCE AS A DESIGN AND CONSTRUCTION AGENT IN THE MILITARY CONSTRUCTION PROGRAM

I. Introduction

Chapter Overview

The Military Construction Program (MCP) is an extremely complicated process which consists of three interrelated phases: programming, design, and construction. This study focuses on the design and construction phases of the MCP. A brief background is presented to familiarize the reader with the Military Construction Program. This will be followed by a discussion of the justification for the study and the scope and limitations of the research. Finally, the research objectives and questions used in the study are presented.

Why Are We Concerned?

The MCP program has long been criticized for the myriad of problems stemming from its complicated, inter-organizational process as shown in Figure 1. These problems hinder the effective management of any MCP program in the Air Force and create a situation which really has no parallel in the private sector. The Air Force MCP manager often is caught in the day to day micro-management aimed toward resolving the latest crises, and loses sight of the "big picture." Therefore, effective contract management of

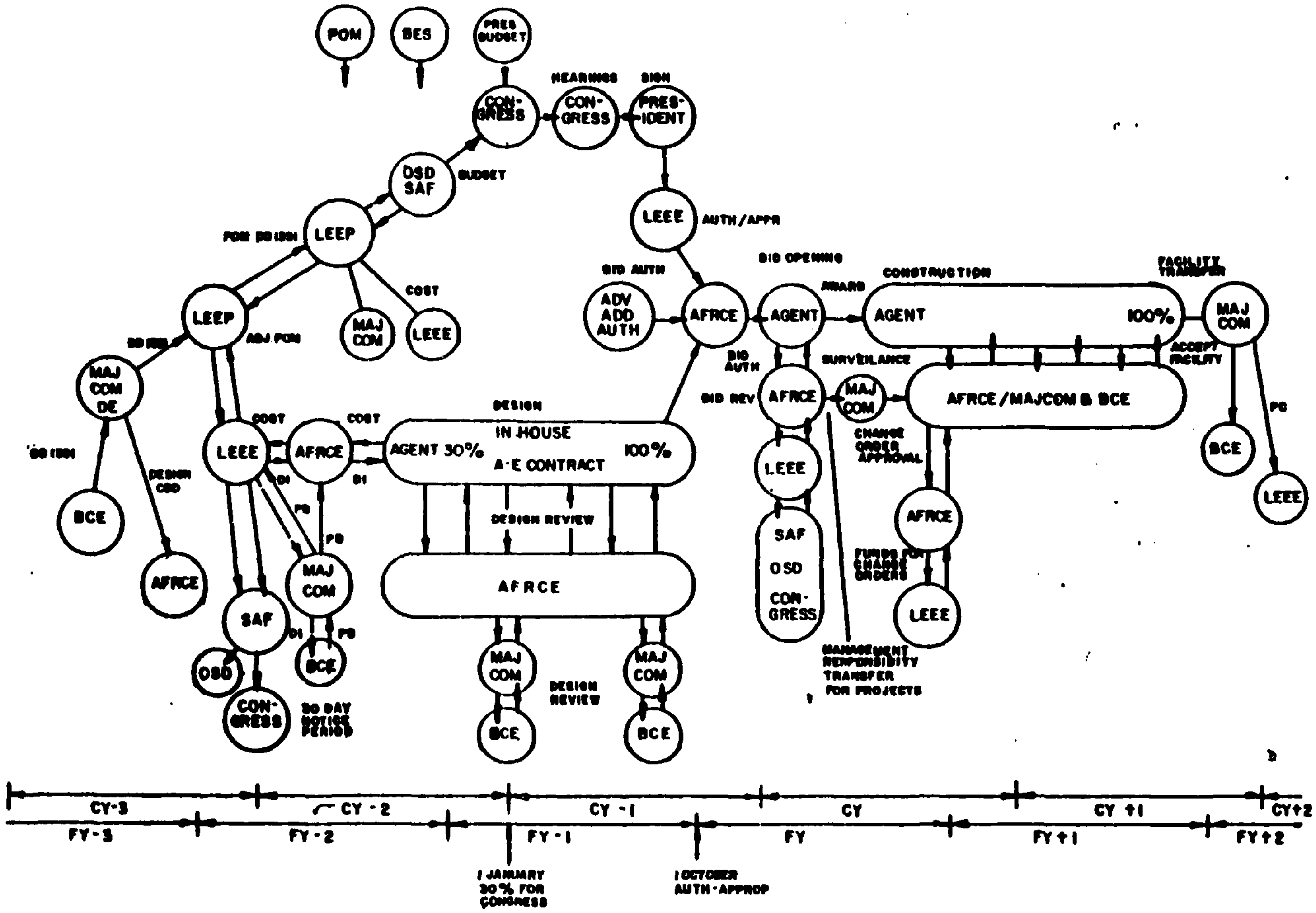


Figure 1. Military Construction Program Cycle [56]

any MCP project is difficult. The current fiscal year (1988) Air Force MCP program exceeds $1.5 billion; and therefore, necessitates a close analysis of the present process to determine any deficiencies (1:186).

Legislative economic restraint will continue to dictate our actions in the future. The Air Force must take appropriate action to minimize the inefficiencies of the existing MCP process. This thesis will study one of the alternative programs being employed in managing the Military Construction Program in the Air Force under the Model Installation Program (MIP).

Background

The MCP process is the primary means for obtaining new facilities and major renovation projects in the Air Force using large-scale construction projects. The funding for these projects is normally in excess of $1,000,000 but may also involve routine construction greater than $200,000. The process begins when an organization establishes a requirement for a new facility. If that particular facility requirement has an estimated construction cost exceeding $200,000, the project must be accomplished through the Military Construction Program (8:3-6). Project approval involves a process which may take from three to five years and consists of three distinct phases (programming, design, and construction). During the programming phase, the Base Civil Engineer (BCE) works with the organization requesting

the new facility by preparing the necessary programming documentation. This documentation is then forwarded through the base's Major Command (MAJCOM) to validate the requirements, and then to the Air Force Regional Civil Engineer (AFRCE), which also reviews the requirement. Finally, Headquarters USAF, Engineering and Services, and the U.S. Congress review the project request for approval and authorization. Once approved by Congress, Headquarters USAF directs the AFRCE, MAJCOM and the BCE to proceed with the design of the project. The design and construction phases of the project involves the same agencies with the addition of the U.S. Army Corps of Engineers (COE) or the Naval Facilities Engineering Command (NAVFAC), U.S. Navy. The design of MCP projects is usually performed by an Architectural-Engineering (A-E) firm selected by the Design Agent (DA) (8:13-15).

The COE and NAVFAC are the designated design and construction agents for U.S. Air Force (USAF) MCP projects, in accordance with Department of Defense (DOD) Directive 4270.5, <u>Military Construction Responsibilities</u>, and Public Law 94-431, <u>Military Construction Authorization Act, 1977</u> (8:1-2). Both organizations differ from the standard USAF structure of managing projects. The most significant difference being that the COE/NAVFAC project engineer often wears the "hats" of both the engineer and contracting officer. This simply means the COE/NAVFAC engineer often is

authorized a warrant to act as Contracting Officer (CO) in addition to the normal engineering duties. Presently, the COE provides the design and construction management assistance for over 85 percent of the USAF Military Construction Program. In the continental United States (CONUS), the AFRCE oversees the design and construction phases of MCP projects, with the MAJCOMs and BCE providing support and surveillance. Outside of the CONUS, the AFRCE responsibilities are delegated to the MAJCOM (3). However, several Air Force civil engineering organizations have requested and received authority through the Model Installation Program (MIP) to perform design and construction agent responsibilities on MCP projects (28). The first question that comes to mind is, "how effectively are these Air Force civil engineering organizations managing the MCP projects in lieu of the COE/NAVFAC?"

Justification for Study

Although numerous publications were available concerning effectiveness of various USAF organizations, none were found that reviewed the success or failure of those USAF civil engineering organizations managing MCP projects through the MIP program. This study will attempt to provide a vehicle for the evaluation of these authorized bases to determine whether this unique MCP organizational structure is effective.

Scope and Limitations

The scope of this study is limited to examination of Air Force civil engineering organizations authorized to act as MCP design and construction agents, Air Force wide. The goal of this research is not to develop a universal measurement system but one that specifically meets the unique requirements of the MCP design and construction management sections.

Research Objective

The overall objective of this thesis is divided in two parts. First, to identify a measure or a combination of measures which will enable managers to evaluate Air Force MCP organizations operating without the COE/NAVFAC as the design and construction agent. This objective includes both defining the measures to be used and developing a means of reporting these measures. Second, to use the measures developed in the first part to evaluate the performances of selected USAF bases authorized to act as design and construction agents in the MCP process. This evaluation should provide a pool of data for other installations wishing to develop Air Force managed MCP programs.

Research Questions

1. How can an effective measurement system be constructed for USAF MCP design and construction management activities?

2. What measures of effectiveness should be extracted from present information systems such as Work Information Management System (WIMS) or Base Engineering Automated Management System (BEAMS)?

3. How will the measurement system identify problem areas or deficiencies?

4. How successful are Air Force civil engineering organizations in managing the Military Construction Program?

II. Literature Review

Chapter Overview

The literature review covers organizational effectiveness theories, measurement models and present problem areas in the MCP. The organizational effectiveness literature was reviewed to help in evaluating the organizations involved in management of the MCP program. The review of existing measurement models and present problem areas provided the framework in which the methodology was developed to study the Air Force organizations. Research did not reveal any major studies of measurement systems in the Military Construction Program area.

Organizational Effectiveness Theories

The concept of organizational effectiveness has become a popular topic lately with the best selling management books in history being written in the 1980s. However, this concern with organizational effectiveness is not new. The modern era of research on management theory began with the scientific management movement in 1911 by Frederick Taylor. A number of authors since then have conducted or compared studies on the effectiveness of organizations as the unifying theme. These studies help in answering a number of questions: What is effectiveness? What are its indicators? Can it be specified or measured? Why is one organization

effective and another not? A short review of some of the more influential research on effectiveness theories follows (34:514-515).

Steers. In 1975, Richard Steers conducted a review of 17 studies or organizational effectiveness and found a general absence of agreement among them. Fourteen evaluative criteria were mentioned in two or more cases with only one criteria (adaptability-flexibility) being mentioned in over half of the studies. The concept of adaptability or flexibility refers to the ability of managers to adapt their organizations to changes in the working environment. This criterion was followed rather distantly by productivity, job satisfaction, profitability and acquisition of scarce and valued resources. This indicated there was little agreement among analysts concerning what criteria should be used to assess current levels of effectiveness consisting of the following related components: the notion of goal optimization, a systems perspective, and human behavior emphasis in organizational settings (49:50).

Steers found the concept of goal attainment was basic to the various approaches used to assess organizational effectiveness. The major advantage of the goal approach in evaluating effectiveness is that organizational success is measured against organizational intentions instead of an investigator's value judgement. Because different organizations pursue divergent goals, it is only logical to recognize this uniqueness in objective evaluation attempts. Another

advantage of the goal approach is that it can be easily quantifiable with careful selection of goal parameters (49:51).

The goal optimization approach suggests goal maximization is probably not possible and may even be detrimental to an organization's well being. In most cases, a company is unable to maximize both productivity and job satisfaction at the same time, but instead must make compromises to provide for an optimal level of attainment in both areas. This often results in the recognition of multiple and often conflicting goals within an organization. As an example, consider the space program's goal of putting a man on the moon without much regard for cost. The goal was effectively achieved but the goal of efficiency was not maximized. In comparison, the space shuttle program developed the concept of a reusable space vehicle which transferred the emphasis to more of an efficiency goal. This concept of optimization would seem to be appropriate for an organization with multiple goals and multiple constraints like the space program. Goal optimization models also recognize the existence of differential weights that managers assign to various goals and their relevant constraints within the organization. An added advantage of this approach includes increased flexibility of evaluation criteria where the optimal solution changes as the goals or constraints vary. This allows the means of assessment to remain current and reflect the changing needs and goals of an organization (49:52-55).

The second component of the process model employs an open-systems perspective for purposes of analysis. Four major categories of influences on effectiveness from the system perspective are 1) organizational characteristics, such as structure and technology; 2) environmental characteristic, such as economic and market conditions; 3) employee characteristics, such as job performance and job attachment; and 4) managerial policies and practices. These four sets of influences must be relatively consonant if effectiveness is to be achieved. Negative outcomes result when these characteristics do not fit together (49:54-57).

The system perspective tends to view an organization in a dynamic framework where the various organizational characteristics are constantly changing over a period of time. This is common in organizations that tend to be fluid in nature. Often, it is not the change in quantitative goals but the organization itself that becomes dynamic with personnel changes. The changes in personnel result in different personalities that may cause a corresponding change in emphasis of the goal optimization process. These changes are primarily due to varying leadership styles and personal biases of each individual that assumes a position of influence. Thus, managers have the responsibility to understand the nature of their environment and to set realistic goals to accommodate that environment. The more effective organizations will tend to be those that successfully

adapt structure, technology, work effort, policies, and so on to facilitate goal attainment (49:59-60).

Organizational effectiveness from the human behavior aspect involves examining the role of individual behavior and its impact on organizational success or failure. Steers believed greater insight could result in effectiveness analysis if consideration of individual behavior was included. This involved examining the many variables that make up an individual's contribution to goal attainment including relative competence, experience, expertise, and knowledge of procedures (49:60). A good example of the importance of individuals in goal attainment is the use of automobile seat belts.

> The federal government set out to improve traffic safety by passing a law requiring the installation of seat belts by auto manufacturers. When this action failed to obtain the desired consequences since people simply did not use them, the government passed additional laws requiring manufacturers to install warning lights, buzzers, and other alarms to remind drivers to use seat belts. When these laws proved ineffective, laws were passed requiring the installation of devices requiring the use of seat belts in order to start the ignition. Finally, when even these laws did not improve seat belt usage, laws requiring the wearing of seat belts were passed. The initial means to improve traffic safety were ineffective because they ignored the predispositions and behavior patterns of most drivers [49:60-61].

Therefore, any study of organizational effectiveness needs to recognize the importance of people who ultimately determine the success or failure of an organization.

Campbell. John P. Campbell reviewed organizational effectiveness literature in 1977 and presented criterion

measures for effectiveness to be used to compare organizations, evaluate the effects of organizational development efforts, and determine what characteristics are significantly associated with organizational effectiveness as a basic construct. The various criterion measures consisted of such indicators as flexibility/adaptability, productivity, job satisfaction, turnover, training, morale, conflict/cohesion, goal consensus, quality, growth, and several other criteria totaling 31 in number. Organizations were also perceived to be of either the goal centered or natural system type model based on the studies reviewed (34:518).

Campbell found a relative lack of value in objective inquiry and advocated the use of more organization-specific models based on clear and specific assumptions. This would result in organizational effectiveness representing the degree an organization's end goals were met subject to relevant constraints. Campbell suggested the use of two particular types of research designs involving simulation studies and intensive case studies. These two types of designs would promote a more interactive community of researchers and practitioners. For example, researchers would be able to immerse themselves in the phenomena being studied and give the required attention to the practitioner while keeping a proper perspective on the political realities of the organization being studied (34:518-519).

Zammuto. Raymond F. Zammuto viewed organizational effectiveness as a reflection of the degree to which an organization is being responsive to its constituent preferences. If the organization is fulfilling the demands of the constituencies in terms of what they feel is good performance then the organization is effective. If not, the constituents will seek alternatives and therefore jeopardize the survival of the ineffective organization. These judgements of effectiveness are very complex and often result in the constituents only taking into consideration the specific facets of performance which are of importance to them. Thus, different constituents evaluate different aspects of an organization's total performance and rarely judge all aspects (64:1-3).

Another factor in determining organizational effectiveness is the constituent preference for performance change over time. This complicates the concept of organizational effectiveness since, as preferences for performance change over time, the method by which constituents evaluate a particular organization will change. A good example is the 1973-74 oil embargo which marked the beginning of the fuel shortage. Prior to the embargo, the American public was satisfied with the large cars produced by the American auto industry. After the embargo, consumer preference dramatically shifted to the smaller, fuel efficient cars made by foreign automakers. This was mainly a result of the

consumer perceiving the American auto industry as being unable to satisfy the demand for these new preferences. Thus, the organizational survival of American automakers was severely jeopardized until the changing consumer preference could be met (64:3-5).

Peters and Waterman. The pair of management consultants, Thomas Peters and Robert Waterman, closely studied 62 widely admired corporations. They found that excellent organizations are "forever young in spirit" and exemplify the following eight traits:

1. The organization is in the action mode at all times.
2. Excellent companies stay in tough with their customers.
3. Excellent organizations "breed" champions.
4. Excellent organizations draw their power from their rank and file.
5. Excellent companies live by the spirit and the letter of their beliefs.
6. Excellent organizations stick to their knitting.
7. Excellent organizations keep their form simple and their staff lean.
8. Excellent organizations communicate.

Peters and Waterman offered several thoughts on the excellent companies in their studies. The outstanding organizations were simply brilliant on the basics. These companies worked extremely hard in keeping things simple in

their complex environments. Additionally, these companies persisted and insisted on top quality. They paid attention to their customers and listened to their employees, treating them like adults. These companies were not afraid of "some chaos in return for quick action and regular experimentation." Outstanding companies are led by "transforming" leadership that calls for excitement and fervor and "can create environments in which people can blossom, develop self-esteem and can be excited participants in the business and society as a whole" (34:522-524).

Measurement Models

In order to evaluate an organization, a full understanding of the relationships of its component parts to the whole is necessary. This can be accomplished by constructing a model or a method for generating measures. Many models of organizational productivity, efficiency, and effectiveness have been constructed with each model attempting to evaluate a particular type of organization either for a limited application or on a universal basis. However, the number of models that can be directly applied to Air Force Base Civil Engineering organizations are limited due to the unique nature of a military environment with substantive goals and policy constraints. The following reviews will discuss various models that may be used in the evaluation of government organizations that were most relevant to this study.

Mahoney and Weitzel (General Business Model)

In 1966, Mahoney and Weitzel empirically developed a model to evaluate organizational effectiveness. This model is known as the general business model and is capable of accounting for some 65 percent of the variance in judgements of ultimate effectiveness. This model was constructed empirically from a survey of 238 organizations. The primary criteria for the model in their order of importance are reliability, productivity, planning, and initiation. Planning is composed of criteria such as flexibility, supervisory control, and cooperation. Productivity is broken down into support and utilization. The criteria for support is cohesion while utilization is made up of supervisory support and development (36:357-363).

Department of Defense Productivity Program

In 1975, the DOD established a program requiring each DOD component to implement a Productivity Program on a department-wide basis. The overall objective of the program was to obtain maximum productivity growth to offset the personnel cuts, reduce costs, and free additional funds for other requirements (4:17).

Productivity was defined by the DOD as the combination of efficiency and effectiveness with all programs having the following minimum provisions:

1. Priority emphasis on productivity enhancement at all organizational levels.

2. Maximum use of existing resource management systems established under DOD Directive 7000.1, Resource Management Systems of the Department of Defense, dated August 22, 1966.

3. Development and appropriate use of productivity evaluation indicators which represent true measures of the primary workload or mission for each function included under the Productivity Program.

4. Accumulation of productivity data by major command and operating agency for each applicable function.

5. Utilization of productivity and performance data in the development of requirements and allocations of manpower and fund resources.

6. Adequate staffing and training of personnel to sustain a viable Productivity Program.

7. Periodic field reviews to assess program effectiveness (4:17-18).

Various organizational functions and suggested output indicators are provided in order to compute a productivity index. This index may be expressed as a dollar productivity index, a ratio of outputs to dollar resources expended, or as a labor productivity index, a ratio of outputs to labor resources expended. However, no measures are listed for the USAF civil engineering function (4:18).

Baumgartel and Johnson Thesis (1979)

Baumgartel and Johnson attempted to develop a productivity measurement system for the USAF base civil engineering

organization. Their model took the average value of performance indicators for each branch level activity divided by the total resources used to attain the level of output. Productivity was defined as the measure of effective and efficient use of resources to attain results which are directed towards the strategic level organizational goals through the branch level objectives. Quantitative performance indicators for various civil engineering sections were listed but were inadequate and required additional data as suggested in the authors' recommendation for future research (5:19).

The productivity measurement model has two major weaknesses: 1) the model has not been field tested, and 2) the list of output measures for the individual branch activities is inadequate.

Kaneda and Wallett Thesis (1980)

In 1980, Kaneda and Wallett developed productivity measures for the base civil engineering design branch. Data was collected on proposed productivity measures by using a questionnaire survey instrument. Those surveyed included the BCE, chiefs of design and industrial engineers throughout the bases in the CONUS. The following are measurements that were acceptable to the majority of survey respondents based on statistical analyses:

1. Total estimated dollar amount of contract projects and in-house work orders designed divided by total design manhours.

2. Total number of projects designed (complete and ready for acquisition action) divided by the total design manhours.

3. Total number of facility inspections and utility systems surveys completed divided by total manhours to complete surveys and inspections.

4. Total estimated dollar amount of architect-engineer (A-E) design acquisition packages prepared divided by total manhours to prepare.

5. Total estimated dollar amount of contract projects and in-house work orders designed divided by total design labor cost.

6. Total number of projects designed (complete and ready for acquisition) divided by total design labor cost (29:76).

Two additional measures were also identified by a partial sample consisting of BCEs and managers with over ten years of experience in the USAF base civil engineering organization. The measures are as follows:

1. Total contract funds obligated divided by total design manhours associated with the contract funds obligated.

2. Number of work orders reviewed and/or evaluated divided by the total manhours required for review and or evaluation (29:77).

Kaneda and Wallett concluded that these measures could be useful as a starting point to measure productivity trends but advised against comparing dissimilar design sections since criteria such as type projects and level of experience vary from organization to organization.

Tuttle and Weaver (MGEEM Model)

In 1986, Tuttle and Weaver developed a methodology for generating efficiency and effectiveness measures (MGEEM), so that measurements could be obtained for any target organization.

Organizations are defined as systems in terms of their inputs, outputs, goals, and interactions with their environments. Within the system framework, productivity is defined as the combination of efficiency (the ratio of inputs to outputs) and effectiveness (the extent to which the outputs satisfy mission objectives).

The advantages of this model to managers include: 1) identifying key objectives of the organization, 2) providing measures for each objective, 3) identifying priorities for increasing productivity, 4) assisting in allocating resources, 5) identifying problems before they become serious, and 6) showing when problems are fixed (57:1-2).

According to this model, productivity has two components: 1) efficiency, the quantity of inputs required to produce a given level of outputs; and 2) effectiveness, the extent to which these outputs conform to mission requirements. The process of generating the efficiency and effectiveness measures is broken down into three phases. Phase One involves interviewing the manager of the target organization after becoming familiar with the operation in order to identify the principal intended accomplishments of the unit, called Key Result Areas (KRA). Phase Two involves interviewing and meeting with subordinates of the manager to develop indicators of each KRA and sources of data for the indicators through a structured group process. And finally in Phase Three, the indicator data is evaluated and analyzed and the findings are reported to the organization according to the principles of feedback, goal setting, and incentives (57:15-25).

MCP Problem Areas

Based on a study by Poe/Brett, the following are some of the reasons given by various based for requesting design and construction agent responsibility:

1. Less overhead costs for a quality product.
2. Dissatisfaction with the COE and the AFRCE.
3. Demonstration of better MCP management procedures to help the Corps of Engineers improve their service.
4. More USAF control of MCP.
5. Quicker response to user needs [40:15].

In order to determine what areas of the MCP process should be evaluated, a review of existing problem area in the program would seem appropriate. The following discussion covers selected problem areas which directly impact the effectiveness of any MCP program.

Customer Satisfaction. In a 1986 Air Force Institute of Technology study on MCP user involvement, Captain Michael Stollbrink found users have a degree of understanding of the MCP process somewhere between adequate to high. The study found no relationship existed between the level of user involvement and the degree of change on MCP projects. However, it must be noted that this study considered changes during the construction phase where there is strong opposition to most user changes. Stollbrink did conclude that a high level of the correct type of user involvement should reduce the need for user generated changes and should result in a user who is better satisfied with the functionality of the facility constructed (50:44).

Captain Stollbrink also concluded from his study that the majority of civil engineering customers in the MCP program felt adequately involved in the reviewing of designs for functional requirements and capable of interpreting design drawings and specifications. However, many of the users surveyed were less aware of the overall MCP process. When asked open-ended questions on ways to improve the user's role in the MCP process, nearly half of the

respondents suggested developing guidelines to inform users of their roles at various points in the MCP process. This possibly indicates users were unable to recognize their importance at various points in the process.

The study indicated users showed the highest degree of understanding in the area of their responsibility to provide functional requirements to the Base Civil Engineer (BCE) during the programming phase. But respondents showed lesser degrees of understanding of the importance and purpose of the project book in the final design (50:40-44).

One of the suggestions from the Project Image report on engineering functions in the BCE was to require mandatory senior level user review of MCP project planning and design documents. They study found that user involvement in MCP programs often began at the final walk-through stage where minimal flexibility existed to tailor the facility to the specific occupant's needs. User representation, at best, was usually at the junior officer or NCO level, while final acceptance was often at the commander level. At that point, many questions were often raised about BCE responsiveness to user requirements with no positive avenue available other than to explain that the best job was done with the information at hand. This problem is often compounded by changes in commanders and lower echelon staff members. The biggest advantages of requiring senior level MCP review would be the

minimizing of "surprises" to upper echelons of the facility users late in the MCP project construction phase. This also forces a coordinated view of user requirements, rather than requirements generated by lower echelon staff members (19:28-29).

Based on a study reporting Air Force leadership's perception of the COE's contract management by USAF General Bryce Poe II and retired USAF Lieutenant General Devol Brett titled, Observations on United States Air Force Construction Programs with Emphasis on U.S. Army Corps of Engineers Involvement, customer involvement was emphasized as a problem especially during design. It was pointed out that "small town" bases in remote locations tended to be emotionally tied to their contractors. So when the COE goes hundreds of miles away to bring in a design firm that has no concern for the local design theme, the base ends up with "monuments to the Corps." These "monuments" are basically facilities that stick out like sore thumbs. A good example was given where a concrete aggregate slab wall building was constructed in Kirtland AFB NM, and located in the midst of the base's southwest style design of buildings. The study also pointed out that civilian engineers, especially at remote bases, stay around for a long time and can provide a continuity of appreciation for a job well done, as well as resentment towards the COE for a poor performance.

Some of the findings in the Poe/Brett study indicated perceptions of the COE not being "customer oriented."

Respondents felt that the COE did not have a user-friendly system, which was particularly obvious at MAJCOM and BCE levels. The COE appeared to be more "Bailey Bridge" oriented (i.e., build the building, regardless of the consequences, and move out to another project; don't look back resulting in the USAF customer picking up and paying for all the corrective actions). A few respondents questioned the capability of the COE personnel in respect to complex vertical construction involving high technology design. This criticism was made in view of USAF involvement with COE agencies whose experience had been in civil projects entirely dissimilar to Air Base construction. Other perceptions of COE relations included lack of responsiveness due to geographic location of COE representatives, personality bias influencing decisions or causing disruptions, and ambiguous differences in functional and technical reviews, with the COE using their definition of the difference to preclude the Air Force from getting too involved in changes (40:35-37).

The U.S. Army engineering District, Mobile, Alabama, under the command of Colonel C. Hilton Dunn, conducted a Customer Care Survey directed at different levels of BCE management. The results revealed that 66 percent of the survey respondents were satisfied overall with the COE's performance and 77 percent would choose the COE as their construction agent again. However, 56 percent felt that

major problems existed in the way the COE treats its customers. The open-ended responses on the "customer orientation" of the COE in the survey supported the findings of the Poe/Brett study (37:15-17).

In interviews with Mr. Tony Sculimbrene, Chief of Contract Management, 2750th ABW/DEEC, Wright-Patterson AFB, and his staff engineers, the technical complexity and total project length from "cradle to grave" of the MCP project was emphasized as being one of the most important factors in determining customer satisfaction. They stated that this was due to the lengthy process of any MCP project. This elapsed time, which often takes five years from initiation to completion, results in outdated design and user requirements by the time the facility is completed. From past experiences, they stated that changes in regulations, uses, mission or commanders during the life of a project, result in customer dissatisfaction with the completed facility and often require numerous post-completion changes to make the facility functional. The level of communication with the user prior to start of construction was indicated as usually low, since much of the user input occurs during the programming and design phases. However, the level of communication by the USAF construction management representatives with the Design Agent (DA), BCE designer, and Architectural-Engineering (A-E) firm contracted for the

design prior to award or start of the MCP project is considered fairly important. This was especially applicable for the more complex projects (43).

In the Project Image study, one of the observations reported on the BCE construction management function was that there was general dissatisfaction with the handover and start-up procedure for new MCP projects due to the "players" (DA, A-E, BCE, Construction Agent) losing interest. The Image team's response to this situation included the formation of a Project Manager Group within the office of the chief of DEE titled the Engineering and Development Branch. This branch would fill the void that presently exists with MCP projects in which no individual or group is responsible for overseeing all phases and activities throughout the project's life. This organizational structure would allow projects to proceed more rapidly due to continuity of personnel assigned with possible increases in quality and cost improvement due to increased pride in the end product by the individual assigned to the project (19:I-V).

Project Management. Based on the response to an Air Force Institute of Technology (AFIT) survey done on key USAF personnel involved in the MCP process, Captain Gerald Dutcher found that a significant number of the respondents felt the review and change process and the length of projects were major areas of concern in the MCP (15:80-81). Those surveyed expressed the need for restructuring of the present

MCP process, with the elimination of unnecessary layers of management. Some respondents suggested eliminating the AFRCE, while others advocated that "the Air Force was capable of performing the agent's (COE/NAVFAC) responsibilities and, as necessary, could contract out for an Architect-Engineer (A-E)" (15:81). This reduction in the "extra layers of management" would possibly reduce the time required for review and changes which in turn would reduce the length of projects (15:81-84). These problems represent a major concern to the Air Force due to the size and complexity of the MCP. In 1988 alone, the Air Force expects to exceed $1.5 billion in project funding (1:186-188).

In the Poe/Brett study, many respondents felt the change process remains as one of the major issues seriously impacting the effectiveness of the MCP. Most of those interviewed felt the change and review process was not mission-oriented, not customer oriented, cumbersome, judgemental, arbitrary, and generally non-responsive. Often, the source of discontent in the change process and a source of resentment seemed to be centered around the instances where there was disagreement in professional opinions over what the correct technical solution was, rather than whether a fix was needed. The respondents felt more mileage could be gained if the meetings could be scheduled on site instead of some building remote from the actual construction (40:10).

The Project Image study reported that the existing Design Agent's contingencies in the MCP (two percent) forces change order approval through unnecessarily complicated channels further up the chain. Suggestions were made to increase this contingency amount to five percent, which would decrease delays in design changes. The study reported that the review process simply takes too long when compared to the private sector, and therefore contributes to unnecessary delays. Streamlining of the review process was recommended with elimination of specific and individual reviews in order to consolidate the process. Change orders during construction often result in substantial costs to process, with hidden costs arising out of delayed project deliveries and people's time involvement. Although there appears to be no single solution to construction change orders, aggressive reviews and site visits prior to start of construction can provide significant benefits. Other recommendations include giving limited authority to bases for changes, allowing no time/cost changes to be approved by inspectors, establishing suspense dates for change order approval procedures with estimated cost effects of any delay, and conducting in-depth studies to determine the time delays and costs involved for changes and to ascertain the reason for them (19:I-V).

Major General George E. Ellis, Director of Air Force Engineering and Services, commented that, "No matter how

interested the Corps of Engineers guy is in the Air Force project, I can find an Air Force guy more interested because he has to live with it and operate it" (33:134). The fact that the Navy or Army is responsible for inspecting an Air Force MCP project can lead to problems especially if their inspection standards are not consistent with Air Force standards.

In Dutcher's AFIT study, many respondents expressed displeasure with the Construction Agent (CA) and wanted the authority to either partially control the CA or to perform the inspection themselves. One frustrated respondent noted, "When we see the COE giving away the ball game, we should have the authority to insist on proper construction management." Also, many of the respondents felt too many levels of management existed in the MCP process, and a reduction of these levels was necessary to increase responsiveness during construction. Those surveyed generally felt the Air Force was capable of performing DA or CA responsibilities (15:81-84).

Project length was perceived as the second biggest problem affecting the effectiveness of the MCP. Specifically, those surveyed in Dutcher's study identified programming, design, and modifications processes as excessively long when compared to private industry standards. As mentioned earlier, the length of the phases result in either the requirements, technology, mission, or key personnel having changed by the time the project is completed (15:77-78).

In interviews with Mr. Tony Sculimbrene, the use of engineers in lieu of the more traditional technician/craftsmen type of inspector to oversee MCP projects was recommended for surveillance type projects. This change in manning standards and use of higher personnel skill level (GS-11/12) positions appeared to be more effective in the surveillance of MCP projects at Wright-Patterson AFB, after experimenting with both types of inspectors (43).

In the Project Image study, numerous recommendations were made in the areas of improving performance in BCE construction management. Some of the recommendations included increased computer applications to support project management (numerous software packages are available to assist in work scheduling, project tracking, etc.); increased support for training including development of "how-to" manuals and video tapes; eliminating pre-final inspections to force contractors to perform their own quality control; elimination of Air Force requirement (AFR 89-1) for weekly surveillance of MCP projects and documentation, since the complexity of the MCP project should determine the frequency of surveillance and documentation; periodic project inspections by shop personnel and design engineers resulting in high communication throughout BCE and possibly correcting problems before they occur (19:I-V). Many of these ideas are simply based on creative and innovative thinking, and can be incorporated into an organization's project management policy without any formal regulations or

changes. Often, the personality of the chief of construction management will determine how MCP projects are managed.

The Poe/Brett report indicated a mixed response on the attendance of COE personnel at USAF weekly/monthly base commander meetings, but most were in agreement that meetings between COE and USAF civil engineering personnel during construction were essential to minimize problems (40:15-20).

The civilian-military mix in BCE causes reduced work force productivity according to the Project Image team's observations. Junior enlisted personnel created a significant training burden that was shouldered by senior military and civilian supervisors and foremen. Furthermore, military training requirements would constantly deplete manpower. These type of problems become particularly acute during heavy workload periods (19:I-V). Emphasis on training programs and the proper mix of civilian to military are especially crucial in large, complex MCP projects.

Project Turnover/Warranty. The general consensus of the literature reviewed points toward the turnover/warranty phase as the greatest problem area in the MCP. The Poe/Brett study reported the following Air Force perception of the last five percent of construction:

> Too often excellent COE performance through design and 95 percent construction is overshadowed by serious problems in the last 5 percent--turnover to the customer. The USAF perceives this as a COE penchant for "building and moving smartly on" without regard to final condition or subsequent operation and maintenance of the facility. Complaints of this nature were heard on every station and at every Major Command [40:21].

During the acceptance and turnover process, similar perceptions were expressed, but with some of the blame placed on the Air Force civil engineering for folding to pressures to accept incomplete structures in order to meet mission requirements (40:13-14).

Another perception of difficulties encountered during this turnover process was reflected in the following respondent's comments:

> The COE is seen losing interest in clearing punchlists or insuring prompt contractor response to equipment malfunction or construction errors. The turnover is relegated to less qualified people who have fewer resources and lower priority. The result is a wound that festers until the facility is finally completed, sometimes after months or even years of frustration. In fact, such frustration often leads the USAF to go ahead and spend additional funds, manpower, and material resources to solve the problem, guaranteeing lost revenue to the government and a bad reputation for the COE [40:21].

These perceptions may indicate that smooth facility transition may be hindered by the lack of responsiveness on the part of the COE and the USAF due to conflicting perceptions of each others responsibilities.

The warranty process is also considered a problem area, with the following perceived weaknesses: 1) not strong enough to insure desired standards of enforcement, 2) difficult and cumbersome enforcement, 3) COE often not helpful in assisting the Air Force in enforcing warranties, and 4) attempts at enforcement often result in backlash to the BCE and base (40:22).

The Project Image study also indicated significant problems during facility transition in the MCP program. The study reported that there was a general dissatisfaction at base level with the low level of attention given on MCP projects in the facility turnover phase. Often, the CA loses interest in the contract finalization, completion of deficiencies and punchlists, obtaining guarantees and warranties, and obtaining proper maintenance manuals and start-up training (19:IV-8).

Interviews with Mr. Tony Sculimbrene and Ms. Lisa Schertzer indicated that post completion inspections (4 and 9 months after the final acceptance) have proven useful in correcting many problems that the turnover process was unable to address or identify. These inspections are conducted by the COE at the request of the BCE and are considered optional (43).

Quality of Work Life. The Project Image study reported that the current high-level of the BCE workload is imposing strains on the work force. The following is a summary of the Image teams's observations:

> Most of the BCE, and specifically, the DEE people we visited are professionally oriented and strive to do a top professional job. However, they are constrained by manpower, funding, and other regulations. They know that much urgently need work is not being done or that short term solutions are being applied. They are concerned with this situation and foresee little change in the future. Their frustration levels are high and can be expected to stay that way. In short, we saw alot of dedicated people on the job, but not alot of happy people [19:IV-9].

The study provided several recommendations for improving the quality of work life with more guidance in career path fields, increased training and education, and enhanced career opportunities for professional development. These recommendations would possibly improve morale and prevent employee migration (19:I-IV).

In our interviews with the MCP staff engineers at Wright-Patterson AFB, we learned that high turnover rates were common due to the size of their program, which exceeded $147.3 million as of February 1988. Although some of the turnover was due to promotion, better job offers and relocation, part of the turnover was also attributed to a variety of problems including manning, lack of career advancement and training, and difficult working conditions (43).

The areas of concern discussed in this portion of the chapter represented the perceptions of those individuals directly involved in the MCP program. The identification of these problem areas, the existing measurement models and the discussion of organizational effectiveness theories are based on the cumulative information collected from the various publications reviewed, interviews conducted and personal experiences of this author. The information presented in this chapter should aid in the evaluation of the performance of organizations involved in managing MCP projects.

III. Methodology

Chapter Overview

The fundamental purpose of this research is to evaluate the management of the Military Construction Program (MCP) at bases where the Base Civil Engineer acts as the Design and/or Construction Agent. As part of this research, a study was designed to identify effectiveness measures for MCP management activities at the base level.

Developing an Effectiveness Measurement System

Based on the literature review of organizational effectiveness theories, the general framework for determining what constitutes an effective organization was determined. Using this information, the bases examined in the case studies would be judged for organizational effectiveness.

Additionally, a more quantitative measurement system was developed to evaluate the effectiveness of Air Force managed programs based on existing problem areas in the MCP program. This information was obtained by reviewing existing literature on the MCP program. What resulted was a comprehensive measurement model consisting of numerous quantitative indicators in key result areas. The model was then field tested for validity. Unfortunately, this measurement model had to be modified due to the lack of recorded data in the field. What finally resulted was a

case study approach, using the earlier established indicators and key result areas as guides in examining the organizations under study. The procedures used in developing this earlier measurement system are explained in more detail in Appendix B.

Case Study Justification

The method selected to evaluate the MCP organizations at the authorized MIP bases was the case study approach. As mentioned earlier, the quantitative measurement system developed in this study provided the framework for this case study. The decision not to use the actual measurement system was based on the difficulty in obtaining all the necessary quantitative data desired during field tests of the model. Also, much of the data involving the MCP process was not easily quantifiable.

The case study approach is particularly useful for certain types of problems: those in which research and theory are at their early, formative stages, and sticky, practice-based problems, where the experiences of the "actors" are important and the context of the action is critical. The case study is well suited for this study since the Air Force management of MCP projects started only three years ago. Hypotheses will be generated from the information collected on Air Force managed MCP projects by using the basic principles of a case study. The advantages of using the case study approach are as follows:

1. The researcher can study the organization in a natural setting, learn about the state of the art and generate theories from practice.

2. The case study allows for flexibility in data collection. The researcher has considerable discretion over the type of data collected and also the sources form which the data is obtained such as interviews, documentation, and observation. This allows the researcher to answer "how" and "why" questions to understand the nature and complexity of the processes taking place.

3. The case study approach allows for the presentation of information that the researcher considers to be a rare, remarkable, or atypical instance of some phenomenon.

4. The case study is especially useful for research in an area in which few previous studies have been carried out. It is well-suited for the exploration, classification and hypothesis development stages of the knowledge building process. With the changing environment of government organizations, new ideas are emerging each year from which valuable insights can be gained through the use of case research (6:370).

Some disadvantages associated with case studies also exist and include the following:

1. Results may have substantial amounts of bias due to the nonsystematic collection, condensation, and interpretation of data.

2. Data obtained on a single unit from case studies, like experiments, cannot be used as a base for generalizations about larger populations.

3. The results depend heavily on the integrative powers of the investigator.

4. Case studies such as ethnography or participant-observation often require long periods of time and extensive field efforts (51:136-138).

In spite of the common concerns of case study research when compared to empirical inquiry, a good case study can simply be defined in the following words,

> The essence of a case study, the central tendency among all types of case study, is that it tries to illuminate a decision or set of decisions: why they were taken, how they were implemented, and with what result [63:22].

For the purposes of this study, the technically critical features of the case study strategy which distinguish case studies from other strategies are summarized as follows:

> The case study investigates a contemporary phenomena within its real-life context; when the boundaries between phenomenon and context are not clearly evident; and in which multiple sources of evidence are used [63:23].

This definition helps distinguish case studies from other research strategies. An experiment, for example, deliberately divorces a phenomenon from its context and focuses on a few variables. A history, by comparison, does deal with phenomenon and context but usually with

noncontemporary events. Finally, surveys can try to deal with both phenomenon and context, but their ability to investigate context is extremely limited. Good case study research is difficult and requires an investigator with the proper skills and disposition (63:15-18).

Developing Historical Background

As mentioned earlier in this chapter, a literature review was conducted on existing literature of the MCP program, measurement models and organizational effectiveness theories. This established the impetus to develop the methodology used in this research.

Initial Interviews

Initial telephone interviews were conducted with the civil engineering personnel directly involved in the MCP at the five bases authorized to manage their own program. These interviews were intended to determine the status of each organization's MCP program and to gain support for possible future site visits.

Development of Personal Interview Questionnaire

The comprehensive personal interview questionnaire presented in Appendix A was prepared based on information obtained in the literature reviews conducted in this study. The questions were designed to explore all facets of the Military Construction Program being managed by the respective Air Force organizations.

Field Visits

A trip to Moody AFB was made in May 1988 to visit the MCP Management Office (347th TFW/DEEM). In July 1988, another field visit was conducted to the MCP Management Office at Kirtland AFB (1606th ABW/DEEE-MP). The purpose of these visits was to conduct personal interviews, review various documents, inspect projects and access the existing management information systems such as the Work Information Management System (WIMS). All projects, management plans and records were reviewed. The personal interviews held with all key personnel were incorporated in the research findings. Each interview averaged approximately 90 minutes and was conducted at the interviewee's office. The interviews were taped to facilitate the interview process and to provide an accurate record of all responses.

Synthesis

All the information obtained through the literature review, telephone interviews and site visits was synthesized and presented in Chapters 4 and 5 of this thesis.

IV. Research Findings

Chapter Overview

This chapter presents the research findings of the personal interviews, telephone interviews and on-site reviews conducted. The findings represent data collected primarily from Moody AFB and Kirtland AFB. Three other bases were also authorized to manage their own MCP program under the Model Installation Program (MIP): Hickam, Reese, and Whiteman AFBs. However, these bases opted for managing a smaller portion of their MCP program. This chapter begins with a discussion of the Model Installation Program, followed by background on the establishing of the Air Force managed Military Construction Program, the program development and the difficulties and challenges faced by the new MCP organizations. Then an evaluation of the program in the key problem areas is presented, followed by a discussion on the cost effectiveness and organizational effectiveness of the Air Force managed MCP program.

Model Installation Program

The MIP provided the framework for developing the concept of Air Force civil engineering organizations managing their own MCP projects in lieu of the Corps of Engineers or NAVFAC. The basic idea of the Model Installation Program involved allowing a selected military

base the freedom to control their own destiny and try different things. Mr. Robert A. Stone, Deputy Assistant Secretary of Defense for Installations, credits much of the original success of the MIP program to General W. M. Creech and the Tactical Air Command (TAC). During the early years of the MIP, General Creech requested and received participation of TAC installations in the program. At that time, Colonel George E. (Jud) Ellis was the Deputy Chief of Staff for Engineering and Services at Headquarters Tactical Air Command. Colonel Ellis was responsible for visiting the TAC wing commanders and discussing various aspects of the MIP program. The program stressed excellence in competition, individual authority, and reducing regulations. As a result, Moody AFB became the first TAC model installation. The bae then generated a proposal requesting authority to manage their own MCP projects. The people at Moody AFB felt that they could manage the MCP better and more cheaply than the Corps of Engineers and also deliver a more customer-oriented package. Moody AFB estimated 17 percent of the construction cost was presently being paid to the COE to design and oversee construction for MCP projects. The MIP request stated that the advantages to changing the present policy would be cost savings to the government and eliminating the possibility of the Corps doing a poor job in overseeing construction, due to the lack of understanding of Air Force and TAC requirements. This request was a serious

departure from the existing defense policy but was clearly in line with the objectives of the MIP, especially in the significant reduction of unnecessary documentation. Therefore, the request was approved, and Moody AFB became the pilot project for Air Force management of the MCP program. Other MIP bases soon followed Moody's lead, including Kirtland, Hickam, Whiteman, and Reese AFBs (53:8-12).

Moody AFB, Georgia

Located in southeastern Georgia near the city of Valdosta, Moody AFB is one of twenty Tactical Air Command bases worldwide. The base is the home of the 347th Tactical Fighter Wing, F-16 fighter operations. The base covers 6,050 acres and employs approximately 3,500 military and 670 civilian employees with a estimated payroll of $97 million (2:202). During 1984-1988, Moody AFB experienced the largest MCP program ($24 million) in its history, primarily because of the conversion from the F-4 to the F-16 fighter aircraft. (The approximate dollar value during the height of the program, in 1986, was $20 million) (35).

Establishing the Air Force Managed MCP Program. In November 1983, Colonel Ellis visited Moody AFB to explain the concept of the MIP program to the wing commander (347 TFW/CC) and the civil engineering organization. At that time, he also suggested that if the MIP program were implemented, Moody AFB might want to consider managing their own Military Construction Program in lieu of the Corps of

Engineers. The wing commander, Colonel Harald Hermes, decided to participate in the DOD-wide MIP program, and Moody became TAC's initial model installation (30).

On 10 January 1984, the 347th TFW/DE submitted through HQ TAC/DEM a MIP waiver request (No. 84TM005) to the Office of the Secretary of Defense asking for the authority to manage all MCP projects. This required a waiver of the existing Department of Defense (DOD) Directive 4270.5, Military Construction Responsibilities (23). This request was quickly approved in a 17 January 1984 OSD memo from Mr. Stone to Mr. James F. Boatwright, Assistant Secretary of the Air Force (Installations, Environment and Safety). This authorized the waiver of DOD Directive 4270.5 for the duration of the Model Installation Program test and designated the Air Force as the "design and construction agent for future military construction projects at Moody AFB" (25, 52). However, the memo restricted the agency designation to projects the Corps of Engineers had not initiated any design and construction activity. This restriction meant the design of MCP projects for Fiscal Year (FY) 1985 and 1986 would still be handled by the COE-Savannah District since design activity had already begun. The construction management of the FY 84 MCP projects would be completed by the COE for the same reasons. The agency delegation of design and construction activities is illustrated in Figure 2 (10).

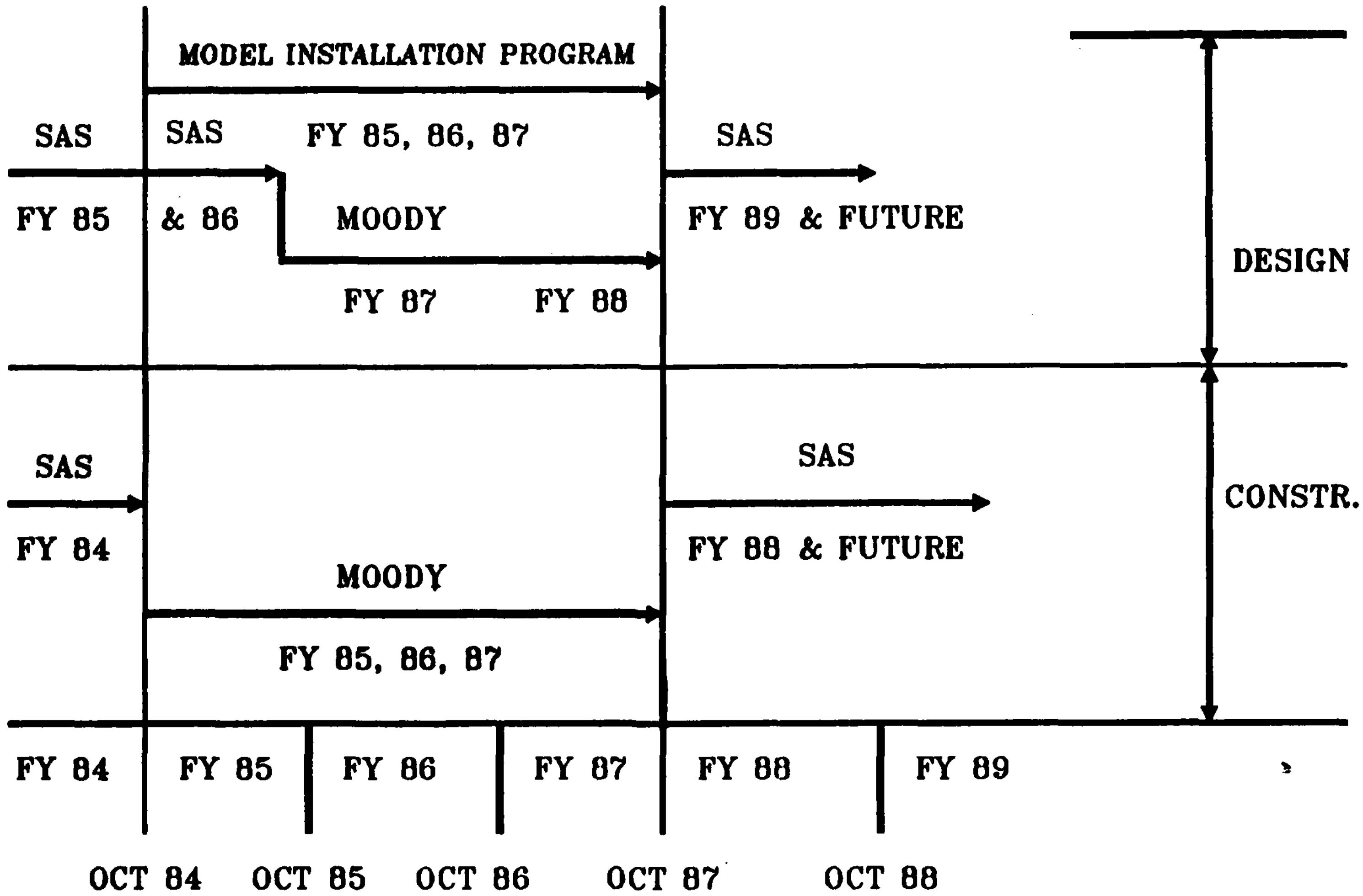


Figure 2. Model Installation Program Overview - Moody AFB

Program Development. Once the authority to manage MCP projects was established, the civil engineering personnel at Moody AFB began to prepare for the new responsibilities. One of the first actions taken involved the submission of an additional MIP proposal (No. 84TM0038). This proposal requested another waiver to DOD Directive 4270.5 which dictated the utilization of the AFRCE for MCP projects performed by the U.S. Army Corps of Engineers. Since the earlier MIP request to delete the Corps of Engineers was approved, Moody AFB requested authority to administer the MCP using base and MAJCOM expertise only. This request was approved on 26 April 1984 for the duration of the MIP. This resulted in the earlier AFRCE functions such as relaying Design Instructions (DI), acting as liaison with HQ USAF, overseeing base compliance with target dates and status reporting being handled by HQ TAC/DEE. The chart shown in Figure 3 reflects the activities and agencies involved in the MCP process after the implementation of the two MIP waiver requests (56).

HQ TAC and the base then began developing the implementation plan. The two individuals instrumental in the development included Mr. Lowell Klepper (347th TFW/DEE) and Captain David Pinkard (HQ TAC/DEE). A meeting was held on 23 February 1984 at Moody AFB with all the key managers involved in the absorption of the MCP program. Colonel Ellis, HQ TAC/DE, along with other MAJCOM individuals, base personnel, contracting and key civil engineering managers

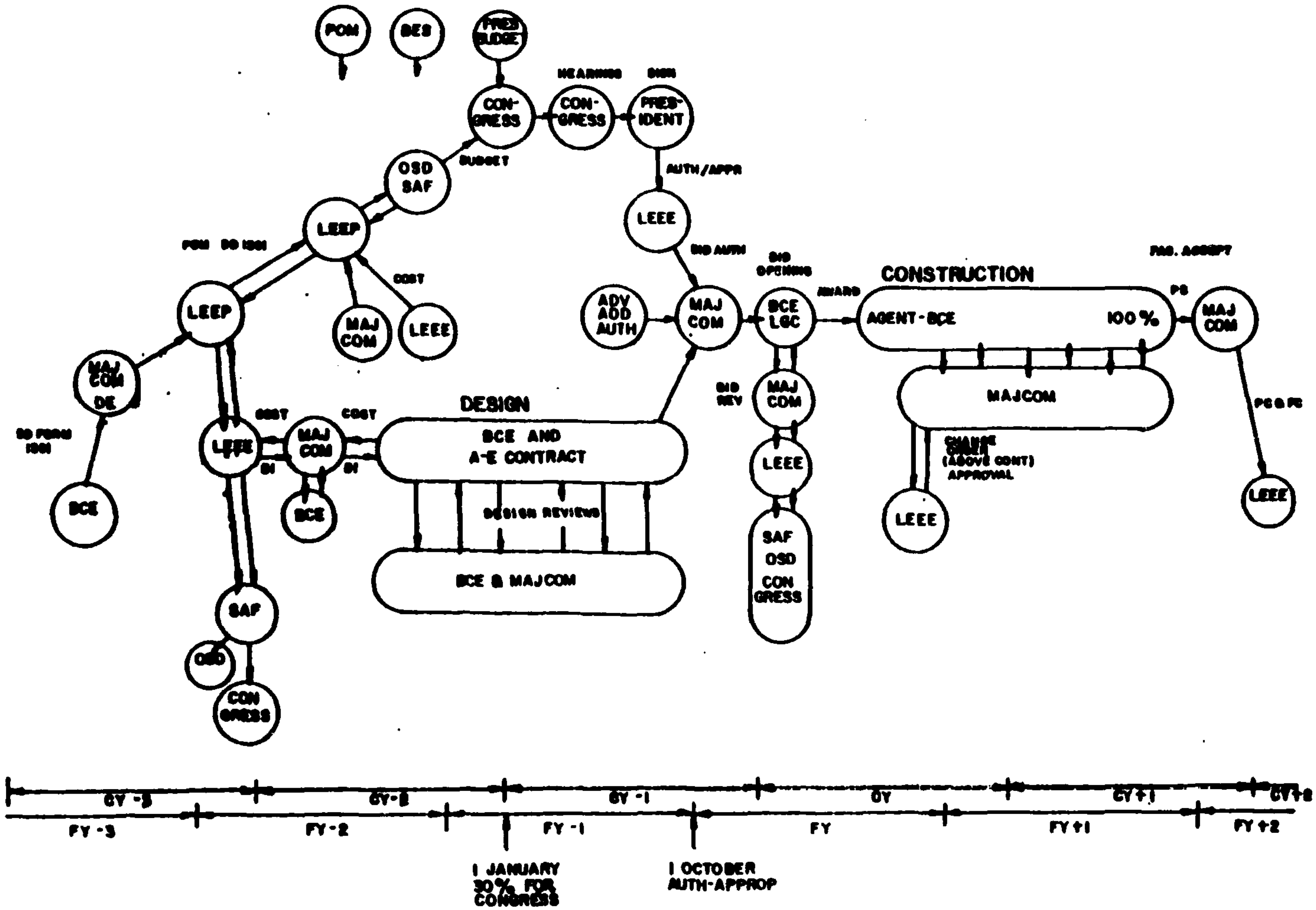


Figure 3. Revised Military Construction Program Cycle [56]

were present. The cradle-to-grave concept was particularly emphasized during this meeting. Other items discussed during the meeting included the required staff additions, formation of the new civil engineering section (DEEM) to manage MCP projects, the new project authority and funding chain of command (Air Staff--HQ TAC--Moody AFB), the purpose of absorbing the MCP program and the present cost of using the COE to manage MCP projects. Initially, HQ TAC agreed to use O&M funds until approval was received to waive the regulations preventing the use of MCP funds for Air Force personnel costs. Term career appointments of up to four years for engineer hires was recommended. Open-end A-E design service contracts to provide technical expertise in certain areas during peak workload periods was also recommended. Finally, a quick list of support action items was developed as follows with applicable milestone dates:

1. Develop position descriptions (PD).

2. Provide PD paperwork to manpower (TACMET) and base personnel (DPC) - 28 February 1984.

3. Develop Resource Management Plan (how to accomplish new program) - 15 March 1984.

4. Write project books, A-E work statements.

5. Establish an acceptable reporting method.

6. Improve technical library.

7. Use Construction Standard Institute Specifications (CSIS) or COE specifications. The type of specifications selected will be on a case-by-case basis.

8. Develop Master Plan - 1 April 1984.

9. Develop separate cost center for DEEM in order to compare Air Force MCP costs with COE services (56).

The management of the MCP effort at the base level was handled primarily by the Engineering and Environmental Branch (347th TFW/DEE) and the Contracting Division (347th TFW/LGC). During March 1984, a plan was drafted for the new program using the idea of a consolidated project office. This office combined contracting and engineering under one roof and acted as an independent unit from DEE and LGC. However, the traditional chains of command were preserved, with the Chief Engineer (DEE) and the Base Contracting Officer (LGC) providing guidance as needed for the engineering and contracting personnel assigned to the project office. This unique organization was given the office symbol of DEEM with funding for the manpower coming from the Base Civil Engineer's (BCE) Operation and Maintenance (O&M) budget. The base organizational setup and chains of command are illustrated in Figure 4. HQ TAC supported the program with O&M funds for its duration. MCP funds for DEEM personnel positions were not authorized due to the existing laws concerning MCP funding procedures. A MIP waiver request submitted by Moody AFB to change this law was disapproved at the Air Staff level (30).

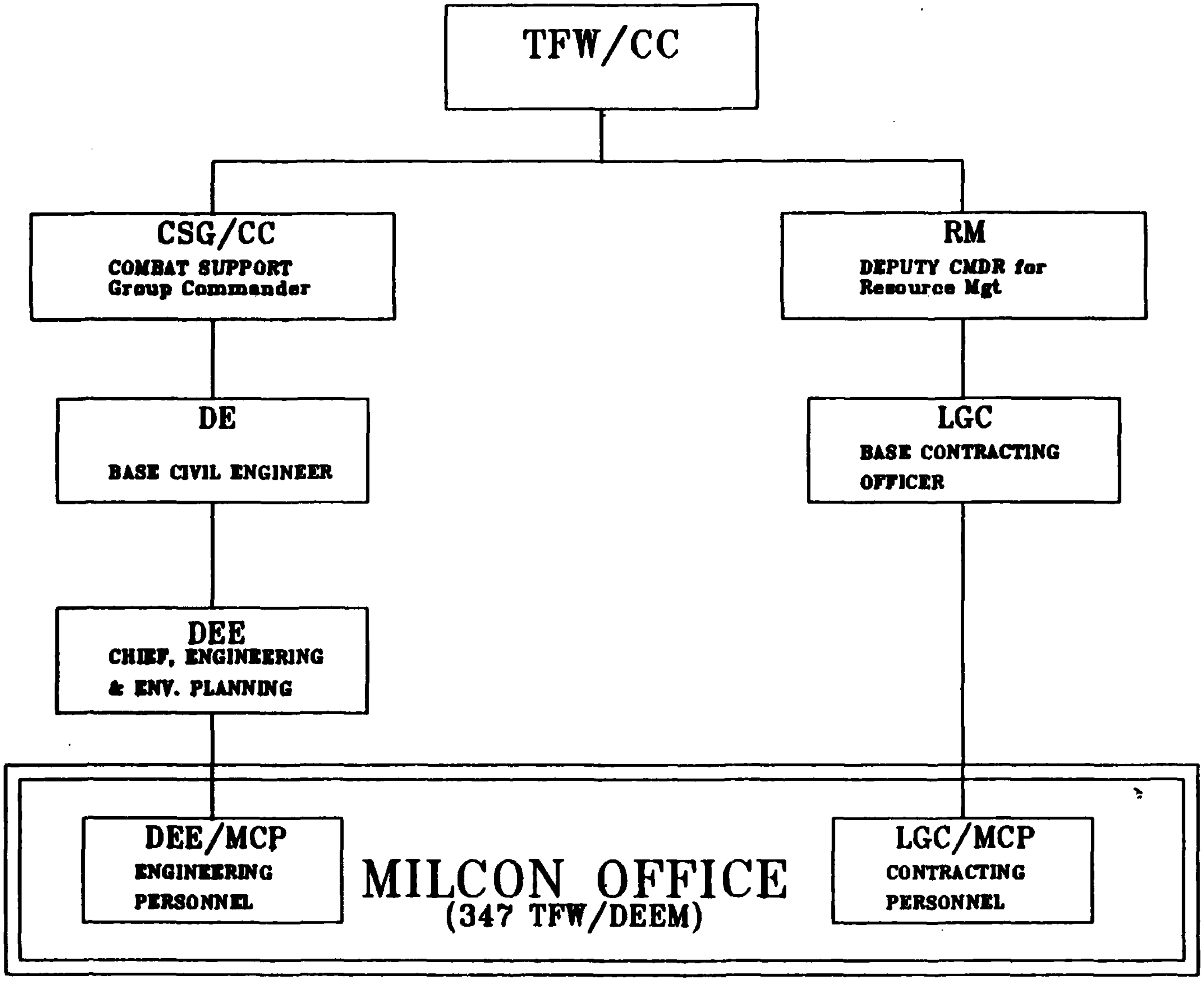


Figure 4. Organizational Structure - Moody AFB

The next step was to begin developing the additional manpower requirements for the management of the MCP program. Mr. Klepper anticipated the need for approximately 15 additional personnel to handle the MCP projects. Personnel were to be hired gradually as the workload increased. Personnel position descriptions were submitted for the new DEEM branch. The engineering unit would be headed by a Senior Engineer, GS-13, who would also act as the administrative chief for the branch and provide guidance and supervision for engineering personnel. The engineering staff would consist of architects, engineers (civil, electrical, mechanical, construction, and general), engineering technicians/construction representatives and administrative assistants. Working with the engineering unit would be the contracting staff, headed by a Contracting Officer, GS-11, capable of independent contracting action. The contracting staff consisted of contract administrators, buyers and clerks. Figure 5 reflects the positions and grades for the new section. The position grades were critical, since Moody AFB felt they needed to attract the expertise for the program rather than train new hires (56).

Duties and responsibilities of DEEM included: 1) project books, A-E Statements of Work (SOW); 2) A-E selection and negotiation; 3) investigative and laboratory services; 4) maintenance of technical document library; 5) issuance of Invitation For Bids (IFB); 6) contract awards;

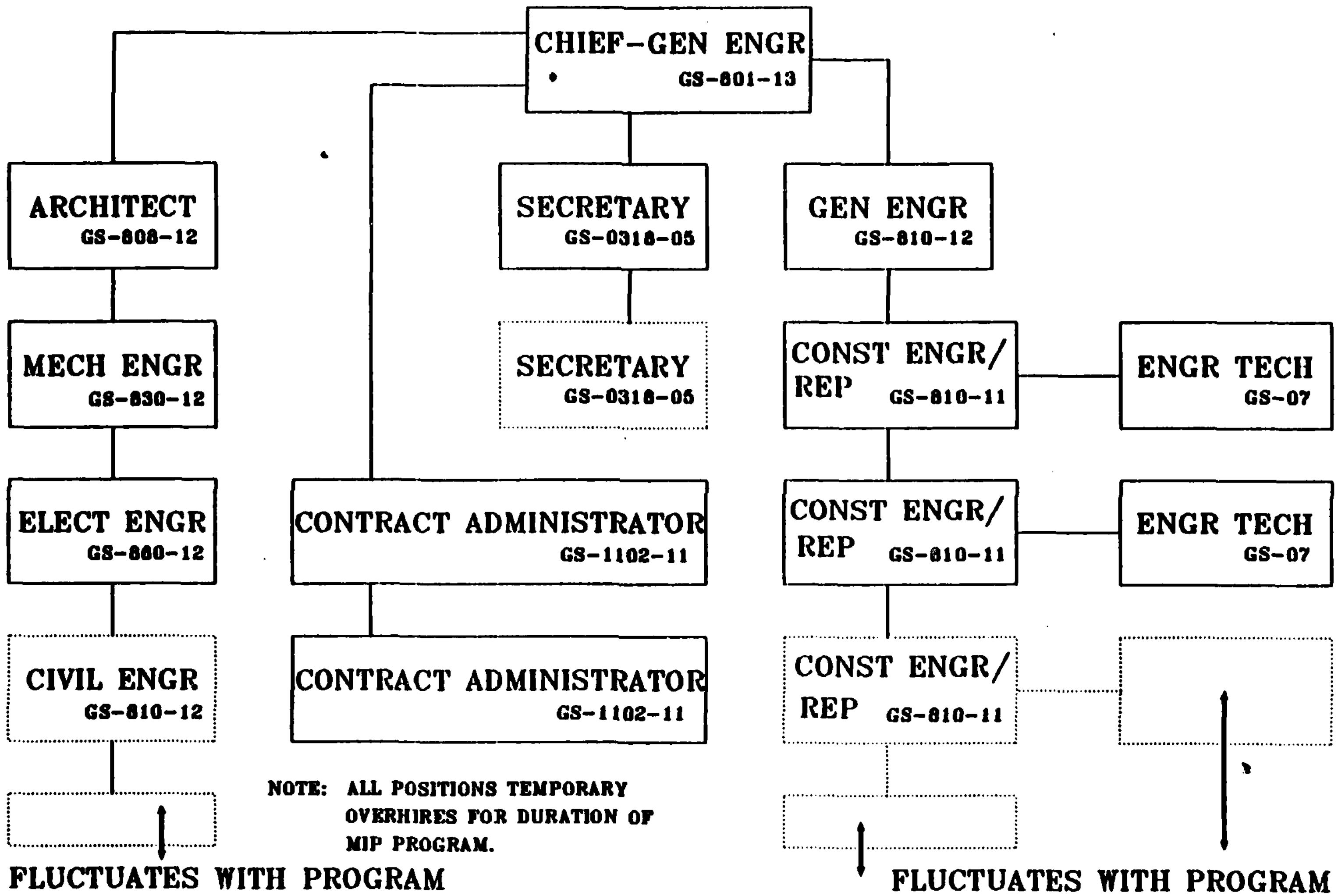
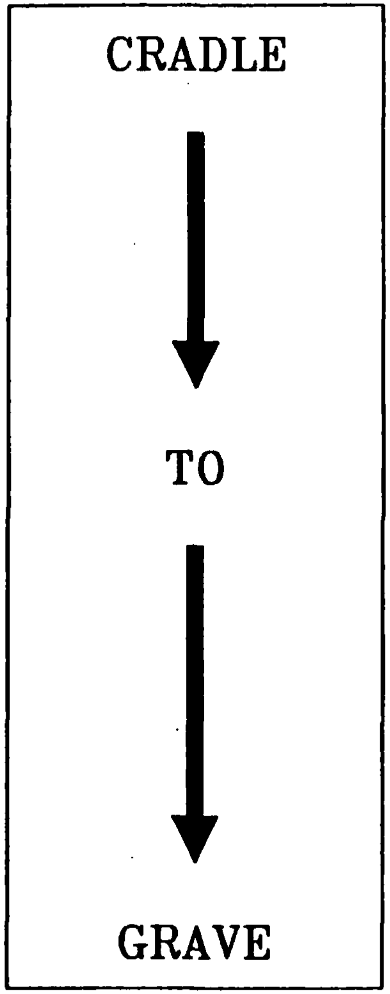


Figure 5. DEEM Projected Manning - Moody AFB

7) scheduling and status reporting; 8) technical reviews of designs; 9) construction inspection, administration and acceptance of projects; 10) real property transfers; and 11) warranty implementation and surveillance. These responsibilities reflect the cradle-to-grave concept of MCP management planned for the new organization and are illustrated in Figure 6 (55).

During the months following the organizational meeting in February, Klepper, with assistance from HQ TAC, processed the necessary documents for the implementation of the DEEM project office. One of the goals of this new program included maintaining accurate records on all expenses incurred in managing the MCP program. The base established a cost center in the engineering branch, and cost codes were coordinated with the local budget office in order to make them compatible with both the Accounting and Finance system and the Base Engineering Automated Management System (BEAMS). From the manpower perspective, the DEEM positions were not shown on the unit manning documents (UMD), due to the use of term appointments. However, HQ TAC provided two captain positions which were shown on the unit manning documents. All civilians hired for the section were shown as overages in the administrative files. The contracting personnel assigned to the project office were accounted for on a daily basis in the same manner as the engineering personnel. This involved the use of an Actual Time Accounting (ATA) cost center (56).



PROJECT (CRITERIA) BOOK PREPARATION

A-E SELECTION

DESIGN MANAGEMENT

DESIGN REVIEWS

IFB PREPARATION

CONTRACT AWARD

CONTRACT ADMINISTRATION

CONTRACT INSPECTION

QUALITY ASSURANCE

PROJECT TRACKING/STATUS

FUNDS TRACKING/MANAGEMENT

FINAL ACCEPTANCE

REAL ESTATE ACTIONS

WARRANTY ENFORCEMENT

Figure 6. Cradle-to-Grave Concept

By November 1984, the DEEM section became operational, and consisted of a chief engineer (GS-13), contract administrator (GS-11), secretary (GS-5), civil engineer (captain), and electrical engineer (captain). This represented the core of the DEEM staff. The first project handled by this staff was project number 85-3002, Natural Gas Conversion. This project was designed by the COE and solicited and awarded by the Air Force for $288,000. No problems were encountered, and the project was completed on time. Then in the spring of 1985, Design Instructions (DI) were received from HQ TAC for the following FY 87 projects: 1) Construct Combat Support Center and 2) BCE Various Facilities. Design of these projects was initiated with the two captains overseeing the A-E firms. These were to be the first Air Force managed projects from cradle-to-grave. But as it turned out, the two projects were deferred indefinitely due to funding cuts. Meanwhile, the staff continued to review projects designed earlier by the COE, and refined and adapted the projects to Air Force standards. These were primarily FY 85 and FY 86 projects which were inspected by the DEEM office. What resulted was a set of specifications and drawings which required a significantly smaller number of submittals, testing requirements and quality controls prior to advertising for bids. Klepper felt the reduction of submittals was a cost savings directly attributable to the program. However, this hidden savings in the awarded

contract price was hard to validate due to difficulty in determining the actual value of the savings (13, 30, 61).

In the fall of 1985, construction of the first new facility in the program began with project No. 85-3001, AGS Parts Store. By this time the staff had expanded with the addition of construction representatives for project inspection and additional contract administrators. Some of the benefits realized on the AGS Parts Store project were minor changes made to the structure to prevent water intrusion into the overhead of the doors installed. The DEEM personnel were able to quickly implement additional changes with a minimum of inconvenience and delay. This was possible only because the DEEM staff was able to work closely with the contractor, and had the flexibility of dealing directly with the contracting officer (30, 56). The COE specifications were also refined to reduce the number of submittals and any excessive testing and quality controls. This practice continued for the FY 86 projects which marked the height of the program with over $20 million in projects. During this timeframe (1986-1987), the DEEM staff consisted of 15 people. The need for a separate office was identified and the DEEM staff was relocated to a vacant office (Building 608) on the base. This marked the collocation of contracting and engineering personnel for the first time. Collocation proved to be a critical factor in the performance of the DEEM office. The concept was advantageous

in managing the MCP projects since it resulted in a more project-oriented attitude rather than a task-oriented one. As Klepper noted, "when people sit side-by-side and drink from the same coffee pot, day in and day out, they are going to coordinate a lot better, faster and get the job done better" (30). This collocation resulted in savings in time and the reduction of administrative duplication. Ironically, this collocation concept was a compromise between civil engineering and contracting, as a result of the BCE requesting for a $50,000 contracting officer's warrant for the chief of DEEM. The chief, Mr. Hunter Davidson, had been issued a similar warrant while working for the COE in the Moody AFB regional office. The contracting community resisted strongly, and the MIP waiver request was ultimately denied at the wing level. However, contracting agreed to collocate after lengthy objections to any type of warrant for civil engineering (13, 30, 56, 61).

By the start of 1987, civil engineering management decided to ask for an extension to the duration of the test project to January 1990. This was a result of base management's satisfaction with the on-going program, and some of the projects starting later than anticipated (30).

Difficulties/Challenges. Initially, the uncertainty of whether any additional manpower would be approved for Moody AFB to manage the MCP created much concern since the upcoming F-16 beddown would be the largest MCP ever handled

by the base. Therefore, civil engineering felt they would be better off leaving the COE as the Design Agent (DA) and the Construction Agent (CA), and just deleting the AFRCE from the MCP projects. They felt the large technical staff at the COE-Savannah District office would prove advantageous in resolving any problems encountered in the upcoming $24 million program. Additionally, Moody AFB expressed no strong dissatisfaction with the past performance of the COE, but felt there was a need to reduce the present layering effect of agencies. However, the approval for the original MIP waiver request alleviated much of those concerns when it stated that the COE would complete any design and construction activity that it had already started. This was followed by the authorization to use O&M funds for manning the new section beginning in October 1984. Term career appointments were used for civilian positions for periods not to exceed 48 months (30, 31, 32).

The possibility of permanently losing the COE Resident Office as a result of the MIP request was initially a concern but was also dismissed after a working meeting with the COE Savannah District personnel in August 1984. At this meeting a Memorandum of Understanding (MOU) was presented by the COE, who were extremely cooperative in assisting the Air Force in a smooth transition. The COE also expressed an interest in the continuation of COE involvement upon completion of the pilot project. Klepper stressed that

prior to the MIP program, Moody AFB enjoyed a good working relationship with the COE. He felt the COE were victims of the system, and not individually responsible for all the negative perceptions by the Air Force. The MOU was approved in January 1985 by Moody AFB with the Air Force performing the MCP design for FY 87 and FY 88 and the construction management for FY 85, FY 86, and FY 87 projects (10).

The hiring of additional personnel posed another problem. Ideally all the personnel hired for the new DEEM office would possess wide experience to avoid the need for training and the typical problems associated with inexperienced personnel in new jobs. However, since management of MCP projects was normally a COE responsibility, few people having the desired experience would be available in the Air Force. Also, Valdosta, Georgia in all probability would not have an experienced technical labor force from which to recruit the needed personnel. These problems were resolved with the support of HQ TAC/DE, which began a talent search for two officers to support the DEEM engineering staff. The hiring of the current COE Resident Engineer at Moody AFB for the DEEM chief position provided the desired experience for guidance and supervision of the staff. This accomplishment was largely a result of the position grades approved for the program. Klepper felt the GS-13 rating authorized for the DEEM chief, and the GS-12 ratings for the staff engineers were critical in attracting the needed expertise. The

inspector positions were filled by using some of the special hiring programs at base personnel (DPC) to facilitate the process. Another option exercised was in-house promotions of existing civil engineering employees. Contracting positions were mostly filled with employees already working in base contracting except for the clerical and administrative assistant jobs. What resulted was a combination of military, civilian and recently retired military personnel being utilized to staff the DEEM office. Open-end A-E design service contracts were also used to provide technical expertise in certain areas. The program was able to attract highly qualified personnel despite the earlier doubts. Another reason for the high interest in the DEEM positions was attributed to the opportunity to work on multi-million dollar projects which was not available in the typical projects handled by the base (13, 30, 55, 56).

In order to insure a smooth transition into Air Force management of MCP projects, outside technical expertise was required for some of the problems encountered on projects. This A-E technical expertise was considered a "fall-back" option, since the DEEM staff did not have the large technical support available to the COE from their Savannah District office. This option was utilized early in the program during the AGS Parts Store contract. The contractor had poured a concrete slab which cracked and appeared structurally questionable. A structural engineering consultant

was brought in to review the problem and provide advice to the DEEM staff. Later in the program, sub-surface soil problems emerged on the hot cargo pad foundations of another contract. A soils foundation consultant was brought in to investigate the problem, along with the COE soils test lab which had done the soils borings during the design phase (13, 30).

COE specifications proved to be a problem during the early stages of the program. The contract management of FY 85 and FY 86 projects by the Air Force involved the use of COE design specifications and drawings. Another possible cost saving involved the deletion of the COE Contractor Quality Control (CQC) program on the MCP projects designed earlier by the COE. The contracting personnel in DEEM felt the CQC program was ineffective and created an added expense during project bidding. According to some of the DEEM staff, these contract documents required extensive review, refinement and revision. The biggest complaint was the excessive amount of submittals and tests required as compared to Air Force specifications. Contracting personnel expressed dissatisfaction in the quality of the COE specifications. Contractors informed them that bids on a project using COE specifications would be higher than a project with Air Force specifications (55, 61). This was confirmed on project No. 84-0002, Bulk Fuel Storage, and project No. 85-3003, Grand Bay Weapons Range, where COE specifications had to be revised after earlier bids exceeded

the available funds. By using Air Force specifications, the projects wee resolicited and received bids within the available funding without reducing the scope of work. Unfortunately, cost savings from not using COE specifications are hidden in the awarded contract price and cannot be tracked as a cost savings in the program.

The COE Contractor Quality Control (CQC) program was criticized by both engineering and contracting personnel. Earlier projects employing the CQC requirements that were managed by the Air Force during construction, resulted in no increase in quality control by the contractor. In fact, the bid prices for projects using the CQC concept appeared higher than normal. Contracting strongly recommended the deletion of the CQC requirement in any future projects (55, 61).

Effectiveness in Areas of Concern. Based on the literature review and interviews on the MCP process done prior to the site visits, the following MCP problem areas were identified:

1. Customer Satisfaction
2. Project Management
3. Project Turnover/Warranty
4. Quality of Work Life

An evaluation of the civil engineering organization in each of these areas based on interviews, project records and personal observations follows.

Customer Satisfaction. Those involved in the Air Force management of the MCP strongly felt the biggest improvement was in the area of responsiveness to the using agency. The DEEM office was able to fine tune on-going construction and design projects to meet user needs and changing requirements. With this new local control of MCP projects, civil engineering was able to be more responsive, more adaptable and more flexible and not subject to the time delays experienced earlier with the COE. The fact that civil engineering no longer had to explain to so many other agencies, such as the AFRCE and COE, what they wanted done and then justifying and re-justifying their requests, appeared to definitely improve their responsiveness to the using agencies. Changes in requirements and philosophy in the individual commanders could be accommodated more readily, and usually at little or no cost, due to the timely manner of the changes in design or construction. This probably was best confirmed in the length it took to process changes to on-going construction contracts prior to the program. Even simple, no cost changes would still take a minimum of six weeks to process with the previous setup whereas with the new program, a no cost change could be processed in 1-2 weeks (30, 55).

Mission changes and equipment changes were common during the design of MCP projects, due to the time it takes to process these projects. As Klepper noted, "Change is the

rule, and we should design our management systems to accommodate change. The MCP process denies change, and when you deny change, you deny customer satisfaction." A good example of this was the Combat Support Center (CSC) project, originally designed to be a "one-stop" facility. Base Accounting and Finance was one of the many tenants to be housed in this new facility. During the writing of the project books (PB) for the CSC project, civil engineering was at the same time renovating another building on base to house Accounting and Finance. At the 20 percent concept stage of design for the CSC project, Accounting and Finance convinced the current wing commander that they should not have to relocate into the new CSC building. However, the Design Instructions (DI) authorized the construction of the CSC facility at 64,000 square feet. Civil engineering was faced with the decision of whether to reprogram the project, and go all the way back to the Air Staff, or find other occupants for the CSC. The DEEM staff found other occupants which resulted in fewer delays in completing the design of the project. This action also provided for the disposal of additional pre-World War II buildings which the newly found CSC occupants would vacate. Although the layout of the facility had to be changed to accommodate the new occupants, the A-E designing the project agreed that no additional cost would be incurred by the government. This was primarily due to the change being caught early enough in the design.

This chain of events allowed the project to maintain the schedule set earlier. Klepper stated, "... had there been any other outside players involved (AFRCE, COE, etc.), the design schedule would never have been met" (30).

The collocation of the contracting and engineering personnel proved to also impact customer satisfaction. Since both disciplines were housed in the same office, no delays due to pending action by either staff would occur. The engineering and contracting personnel actually provided each other with superb support and approached contract problems as a team instead of adversaries. The agency that benefited the most from this cohesion of work forces was the user since project timeliness was improved especially during the construction phase (55).

The partnership that developed between contracting and engineering on MCP projects through collocation proved to be the key in improving responsiveness to the customers. The ability of LGC and DEE to jointly investigate and resolve problems provided the optimum response to customer generated changes, design deficiencies, unforeseen conditions and any other type of changes (30, 55, 61).

The facility manager for the 347th CSG expressed much satisfaction in civil engineering's handling of the multi-million dollar design and construction program in support of the conversion to the F-16 aircraft from the F-4E. Although problems were encountered on projects, the DEEM staff

was able to orchestrate quick and timely actions to minimize the impact of the problems on the project (55).

A good example of this was found on project No. 86-3006, Flight Simulator project. The contract involved interfacing with numerous unknown, underground utilities. Close coordination by the DEEM staff with the BCE electrical shop, the contractor and users affected by the utilities avoided any delays to the project. In addition, close coordination by DEEM on the installation of the flight simulator with the equipment maintenance coordinator, contractor, and using agency resulted in the smooth installation of the complex equipment ahead of schedule. This early installation prevented possible changes (55)

All the projects reflected timely action by the DEEM staff whenever problems arose or close coordination was required in scheduling work. Positive results were not always obtained, but project delays and contractor claims were minimized.

Project Management. During the design and construction phases of managing the MCP, the expertise and motivation of the personnel hired to staff the DEEM section were key factors in the performance of the unit. Although the civilian positions were on a term basis, the base was still able to attract highly qualified individuals which provided the new office with the experience necessary in managing $24 million in MCP projects.

One of the biggest problems in the traditional MCP process is the inability to respond to changes. Regardless if the change occurs in design or construction, delays to the project usually result. By reducing the layers of management (i.e., AFRCE, COE), these delays can be minimized. Often, the time it takes to gain approval from a multi-organizational setup increases significantly with each additional agency. Add to this the distance between the agencies and Moody AFB (200 miles to the COE Savannah District office and 180 miles to the AFRCE in Atlanta) and you have a system plagued with delays and managed by "telex machines." By deleting the AFRCE and COE from the MCP cycle, Moody AFB was able to reduce the time to process changes and reviews as described earlier in the problem area of customer satisfaction. Another good example is the Avionics Facility contract (project No. 86-30002), which involved the construction of one of the largest buildings in the program, with some fairly sophisticated interior finishes, heating/ventilation systems and electrical system. The flexibility of the DEEM office facilitated the addition of six changes to the contract, totaling $142,000, with minimal impact on the scheduled completion date. Four of the six changes were requested by the user, which reflects the responsiveness of the program to the needs of the facility user. The number of changes was low for the

size and complexity of the $2.7 million contract. This was attributed to the tight reviews done by the staff prior to advertising for bids (30, 55).

Since the office was responsible for projects from cradle-to-grave, staff engineers concentrated on a particular project from design through construction. This resulted in contracts being executed much more smoothly than the typical method, where design engineers "dropped" the project as soon as the design was complete. This normally left the construction managers and inspectors with the burden of trying to acquaint themselves with another new project. The DEEM section emphasized the project-oriented style of managing projects versus task-oriented. The DEEM engineers maintained high interest in projects throughout the life of any MCP project, which facilitated the processing of modifications during construction (56).

A project that reflected the advantages of the continuity found with the same engineers, technicians, and contracting officers and administrators being used through the life of a project was the Various Operations/Maintenance contract (project No. 86-3003). This contract was awarded for $2.49 million on 22 July 1986. The contractor began work on 5 September 1986 with completion scheduled for 2 March 1988. The project itself was complex with 10 major components of work phased concurrently and involving different using agencies during the 18 months of the

contract. Each component of work required close coordination with other components to prevent any contract delays. To the credit of the program, the contract was completed on 26 February 1988, ahead of schedule, with a final contract amount of $2.4 million. This final contract amount reflected a reduction in the contract award amount of $91,013, despite the processing of 14 modifications to the contract. This reflected the responsiveness of the section to the users in processing requested changes, and at the same time, the ability of the section to modify the contract without incurring additional costs due to their familiarity with the design (55).

Another good example of the benefit of tight design reviews and strong project management was the Various Munitions Maintenance contract (project No. 86-3004). This $5.8 million contract was the largest in dollar value of all projects. It involved many of the same problems associated with the Various Operations/Maintenance contract. The project began on 19 September 1986 and was completed on 15 March 1988, approximately 44 days behind schedule. However, five changes totaling $376,470 were processed, and the project proved to be one of the most challenging for the staff due to the size and complexity of the contract. The final contract value was $6.17 million. The staff did admit to a work assignment error where the inspector assigned to the project was also responsible for the $2.4 million

Various Operations/Maintenance contract. The Various Munitions Maintenance project was of such a large size and technical complexity that one inspector should have been dedicated solely to this contract. This action may have prevented the contract overrun of 44 days (55).

Project Turnover/Warranty. As mentioned in the literature review, the turnover phase of MCP projects is considered one of the most troublesome areas. Due to the improved reviews and project management done by the DEEM staff, the turnover of projects to using agencies proved to be little or no difficulty on the Air Force managed projects. The responsiveness to the user's needs resulted in a facility which the using agency had no difficulty in accepting. Of the 15 MCP projects handled by the DEEM staff, totalling $24 million, 8 projects were completed on time and the other 7 received contract extensions to the original completion dates, due to larger changes being incorporated into the contract. Those contracts which were extended did not have any major problems in providing beneficial occupancy to the users when applicable (54, 55).

During the warranty periods of all the contracts, the collocation of contracting with engineering proved to be a significant advantage. The contracting officer/administrator was able to immediately support the engineer when warranty problems were identified. No interoffice memos were required

between the two offices as in the traditional setup to handle warranty problems. In addition, the staff was familiar enough with the completed MCP projects to provide the necessary background of any warranty problem. This expedited the repairs, since less time was spent trying to investigate warranty failures. In the traditional MCP setup, much time was spent trying to find out more background information of a particular warranty problem from the COE inspector or engineer. If the contractor was nonresponsive in repairing the warranty failure, the COE would often not be very helpful in assisting the Air Force in enforcement of the warranty (55, 61).

The MCP management by the base provided a hidden advantage in the area of maintenance and warranty work. Since the DEEM office and the maintenance shops both worked for the Base Civil Engineer, close relations existed between the two organizations. Both the shops and the DEEM office were located on base within close proximity of each other. This enhanced any required coordination for equipment training and inspections. This also allowed the shops to gain more familiarization with the facility and its equipment prior to acceptance (55, 61).

Quality of Work Life. The heavy workload of the $24 million program did not appear to impose any major strains on the DEEM section. Instead, the DEEM staff appeared to rise to the challenge of handling Moody's

largest MCP program. Ironically, all the personnel hired for the program understood that their positions were on a term basis with very little chance of becoming permanent. No turnovers were experienced except for the gradual departures of personnel as the program neared its end. Those that were involved with the program expressed much pride in being involved. They felt the program should continue and be implemented on a larger scale (13, 30, 61).

Frustrations did exist within the section between the chief and the engineering/contracting staff. Much of this appeared to be a result of personalities, but many expressed their dissatisfaction with the chief trying to run the section similar to a COE organization. As mentioned earlier, the chief was the Resident Engineer for the COE at the Moody AFB office prior to joining the staff. The contracting personnel especially criticized the section chief for his style of management and lack of familiarity with Air Force regulations and procedures. The staff felt the chief should have had more of an Air Force orientation since the intent of the program was to get away from the traditional methods of MCP management associated with the COE (13, 61).

Some of the workers indicated the temporary upgrades received from their previous positions (i.e., GS-11 to GS-12) provided motivation in the program. However, these employees also risked losing their old jobs since return rights were not offered in all cases (13, 61).

Cost Effectiveness. Although many intangible benefits were derived from the program, costs savings were definitely one of the goals of civil engineering. The necessary cost centers were established early in the program to closely track the costs incurred in the DEEM office. Figure 7 shows a comparison of the actual cost of the Air Force managed program versus the estimated costs of a similar COE managed program based on the projects handled during the MIP program. The COE costs were based on management costs of COE managed projects during fiscal years 1983-1985. These percentages were used in determining what the costs might have been if the COE had continued to manage the FY 85-87 projects at Moody AFB. The Surveillance, Inspection and Overhead (SIOH) costs of the COE was set at 5.5 percent for all MCP projects. The A-E, Project Management and Engineering overhead percentages fluctuated with each project (55, 56). Total cost savings amounted to approximately 3 percent of the contracts executed during the MIP program. This translated to $720,000 in savings compared to the traditional setup.

Kirtland AFB, New Mexico

Kirtland AFB is part of the Military Airlift Command (MAC). It is one of 13 bases worldwide controlled by the command. Kirtland is located south of Albuquerque, and is the home of the 1606th Air Base Wing. The base is unique in that it houses over 170 tenants, including the following

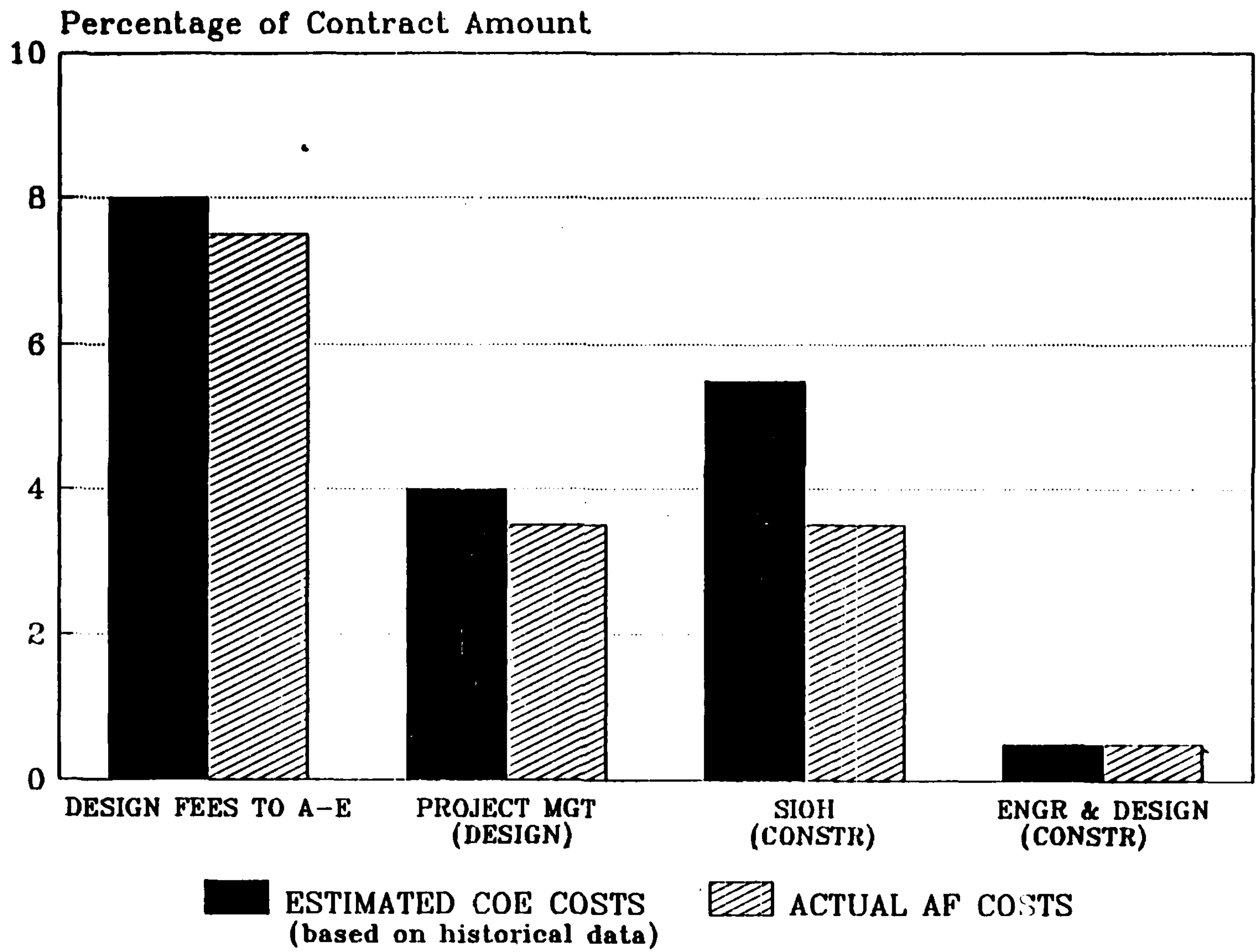


Figure 7. MCP Cost Savings - Moody AFB

major agencies: Air Force Contract Management Division (AFSC), Air Force Operational Test and Evaluation Center (AFOTEC), Air Force Space Technology Center (AFSC), Air Force Weapons Laboratory (AFSC), Defense Nuclear Agency Field Command, Sandia National Laboratories, Department of Energy's Albuquerque Operations Office, Naval Weapons Evaluation Facility and many others. The base covers approximately 52,450 acres and has an elevation of 5,352 feet. The work force is made up of approximately 5,000 military and 14,300 civilians with an annual payroll of $750 million (2:200-201).

Establishing the Air Force Managed MCP Program. As mentioned earlier, the purpose of the Model Installation Program (MIP) was to develop and implement innovative ways to manage Air Force installations and resources more efficiently. Kirtland AFB became a model installation during January 1984 and was designated as the Military Airlift Command (MAC) test base for the MIP. Under the auspices of the MIP program, Kirtland AFB sent a MIP proposal (No. 84-MK016) on 30 January 1984 to HQ MAC requesting a waiver to DOD Directive 4270.5. Approval of this waiver resulted in the authority to delegate to the Base Civil Engineer design and construction agent responsibilities for future MCP projects for which the COE had not initiated design or construction. This request was based on the previously approved MIP program waiver submitted by

Moody AFB, which was distributed to all Air Force model installations. Kirtland AFB received approval of the waiver request on 13 February 1984 from HQ USAF/PRPJ. However, Kirtland AFB opted to selectively manage particular MCP projects and to have the COE manage the remainder. This was primarily due to the size of the anticipated MCP program, which averaged over $12-15 million per year, and the associated manpower problems (26, 35, 44).

Based on interviews with the civil engineering management at Kirtland AFB, the following reasons were given for requesting design and construction agent responsibility:

1. The approval of the MCP pilot program at Moody AFB, Georgia.

2. The determination of base management to keep Kirtland AFB as the top Air Force MIP installation. (At that time, Kirtland had the largest number of MIP proposals adopted Air Force-wide).

3. The "possessive" attitude of base management towards maintaining and managing the base.

4. Civil engineering's desire to delete the "middle men" in the MCP process.

5. Civil engineering's desire to provide a better product for base tenants.

6. The base's dissatisfaction with COE architectural abilities (9, 16, 17, 39).

Program Development. As with the Air Force managed MCP program at Moody AFB, preparations at Kirtland AFB began

shortly after authorization was received to selectively manage MCP projects. The MIP program provided initial guidance through the distribution of earlier approved MIP proposals at other model installations. Mr. Lowell Klepper, 347th TFW/DED, provided documentation (i.e., personnel position descriptions, manning requests, cost analyses, etc.) to Kirtland to assist in developing the program. The key managers involved in planning the implementation of the new MCP program at Kirtland were Mr. Herbert Bohannon (1606th ABW/DEE), Mr. Richard Sotelo (1606th ABW/DEEE), and Mr. David Perry (1606th ABW/DEEX) (17).

On 5 March 1984, HQ MAC/DEE requested issuance of design instructions from AFRCE-Central Region, designating the 1606th ABW/DE as the design and construction agent for the selected fiscal year 1986 MCP projects shown in Table 1:

TABLE 1

FY 86 MCP Projects - Kirtland AFB

Project Title	Project Amount ($000)
Alter Unaccompanied Enlisted Personnel Housing	6,000
ECIP: Facility Energy Improvements	830
Communication Duct System	1,200
Computer/Vault Facility (AFOTEC)	3,800
Technical Support Facility (AFOTEC)	4,200

The balance of the FY 86 MCP projects remained with the COE. Some of these projects were considered to be better suited

for the "engineering" orientation of the COE and included the $47 million, Underground Munitions Storage and the $1.9 million, Dangerous Cargo Pad. This "engineering" orientation referred to the COE ability to handle large civil engineering type projects such as dams, bridges, etc. These projects usually consisted of large amounts of earthwork and concrete/steel construction with less emphasis on the architectural design. The remaining FY 86 projects given to the COE also fell into this category. However, the design staff at Kirtland, 1606th ABW/DEEE, did provide considerable architectural input in the building design of the Underground Munitions Storage project. The MCP milestones are depicted in Figure 8 with the timeframe for design and construction of each fiscal year's program indicated. The approximate time the MCP Management Office was implemented is also shown.

According to Mr. Wes Furman, Associate Director of Major Projects Office (1606th ABW/DEEE-MP), initially much resistance to the new program was encountered from AFRCE and the COE-Fort Worth District. This was primarily due to the concern of these agencies on the impact the MIP program would have on their future manning and workload. However, civil engineering chose to continue the development of the implementation plan. By March 1984, the Kirtland began managing the design activities for the FY 86 projects. Existing personnel in the design branch were used while management attempted to process the necessary personnel positions requests (17).

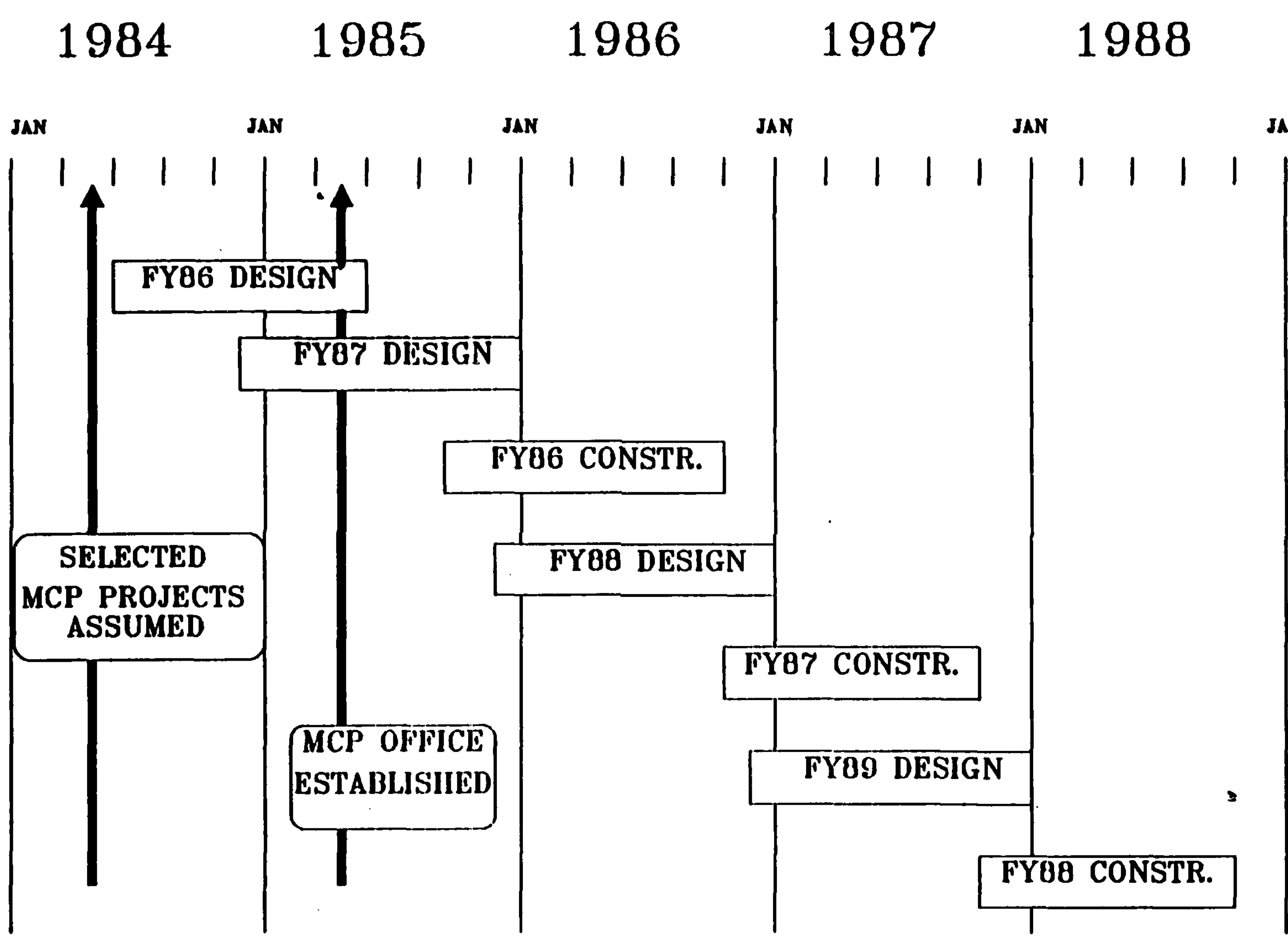


Figure 8. Model Installation Program Overview - Kirtland AFB

On 13 March 1984, the Base Civil Engineer, Colonel James A. Eddings, submitted a formal plan to HQ MAC/DE detailing the on-going implementation of the new program. The plan consisted of the following components: 1) manpower requirements, 2) program cost savings, and 3) MCP Management Office booklet. The booklet outlined the rationale for establishing the new office and the associated requirements needed to support such an office. Additionally, the plan projected the anticipated savings of Air Force managed projects versus the COE managed projects using historical data on past COE projects (35).

Using the same concept implemented earlier at Moody AFB, a new, independent project office was setup to manage selected MCP projects from cradle to grave. MCP projects were managed through the entire MCP cycle, from project inception through the warranty period. This involved assisting the base tenants in identifying their needs, developing a concept, preparing the required documents for program submission and tracking the progress of the project through the budget process. This was followed by the issuance of design instructions once the project was authorized, and then the selection of an Architectural-Engineering (A-E) firm or the assignment of the design to the in-house engineering staff. The MCP office then managed the design and insured all critical milestones were met. Once the design was completed, Air Staff issued the

Authority to Advertise and base procurement solicited bids for the subject contract. Analysis and/or negotiation of bids/proposals were then performed by the MCP office. The new chain of activities in design simplified the coordination requirements as illustrated in Figure 9 when compared to the traditional set up shown in Figure 10 (35).

The long, standard chain had a tendency to be less responsive to user's needs. The design input, reviews and changes went from the user to the Base Civil Engineer, to the Major Command, to the AFRCE, to the COE District, before any actual design is done by the A-E. In the new MCP design procedures, the user is much closer to the actual designer. Additionally, the situation of the COE division and the A-E being geographically separated from the base user is eliminated. During the construction phase, the MCP office managed the majority of projects with the necessary inspections accomplished in-house. The traditional chain of events and the modified setup under the MIP program are illustrated in Figure 11 (35).

The MCP office also conducted post-occupancy evaluations to determine if the tenants' needs were met to help in future projects. Under this cradle-to-grave concept, continuous project management was provided from programming to construction completion by the same engineering staff. This eliminated the "lost time" normally encountered during the turnover of projects from one agency or branch to another. This system instilled major responsibility and

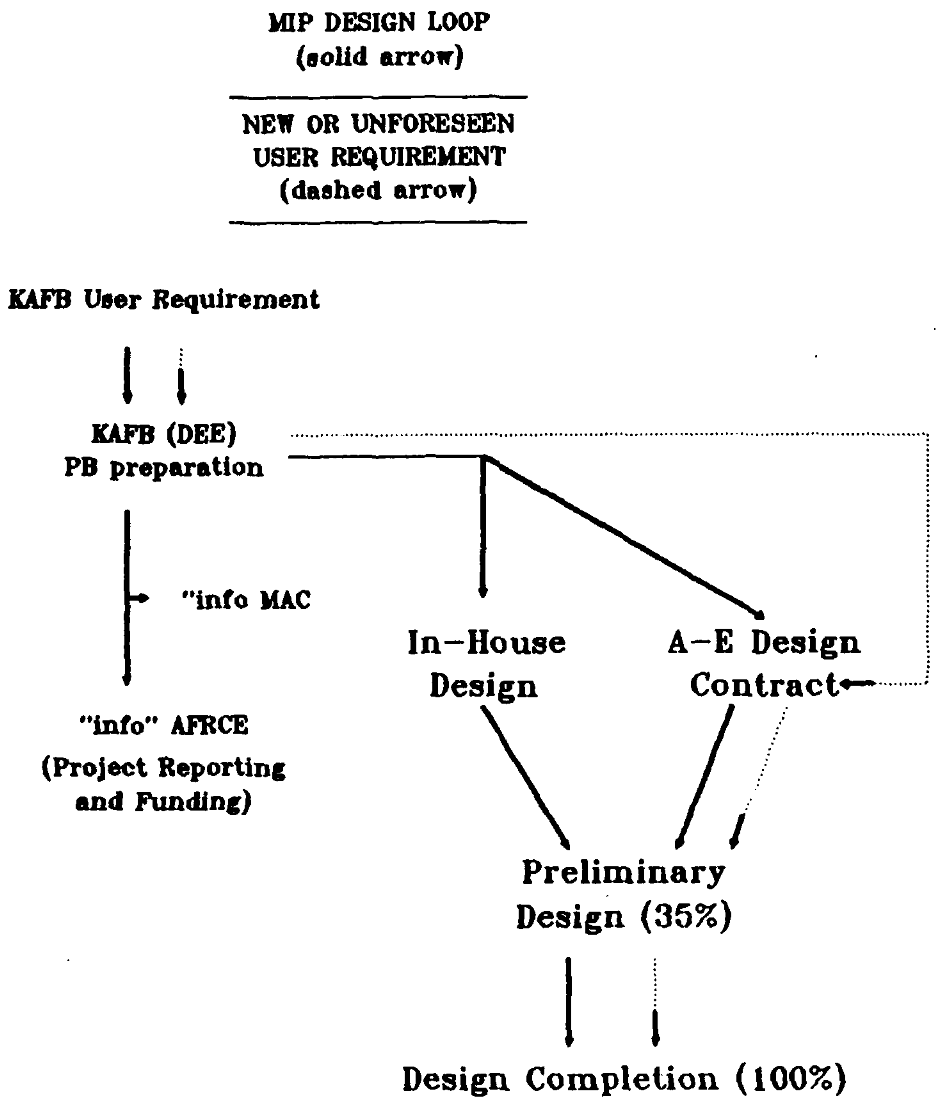


Figure 9. MCP Design Procedures (MIP) - Kirtland AFB

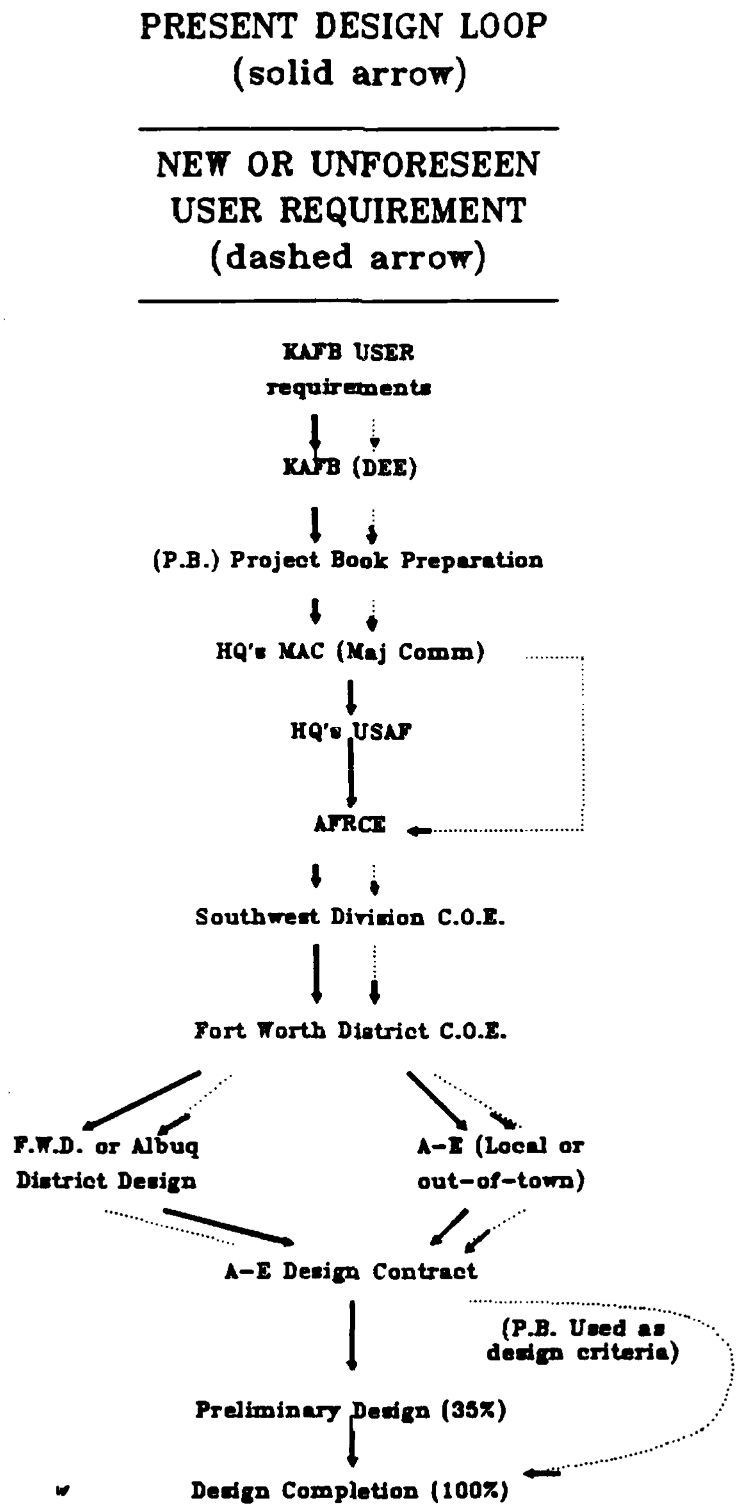
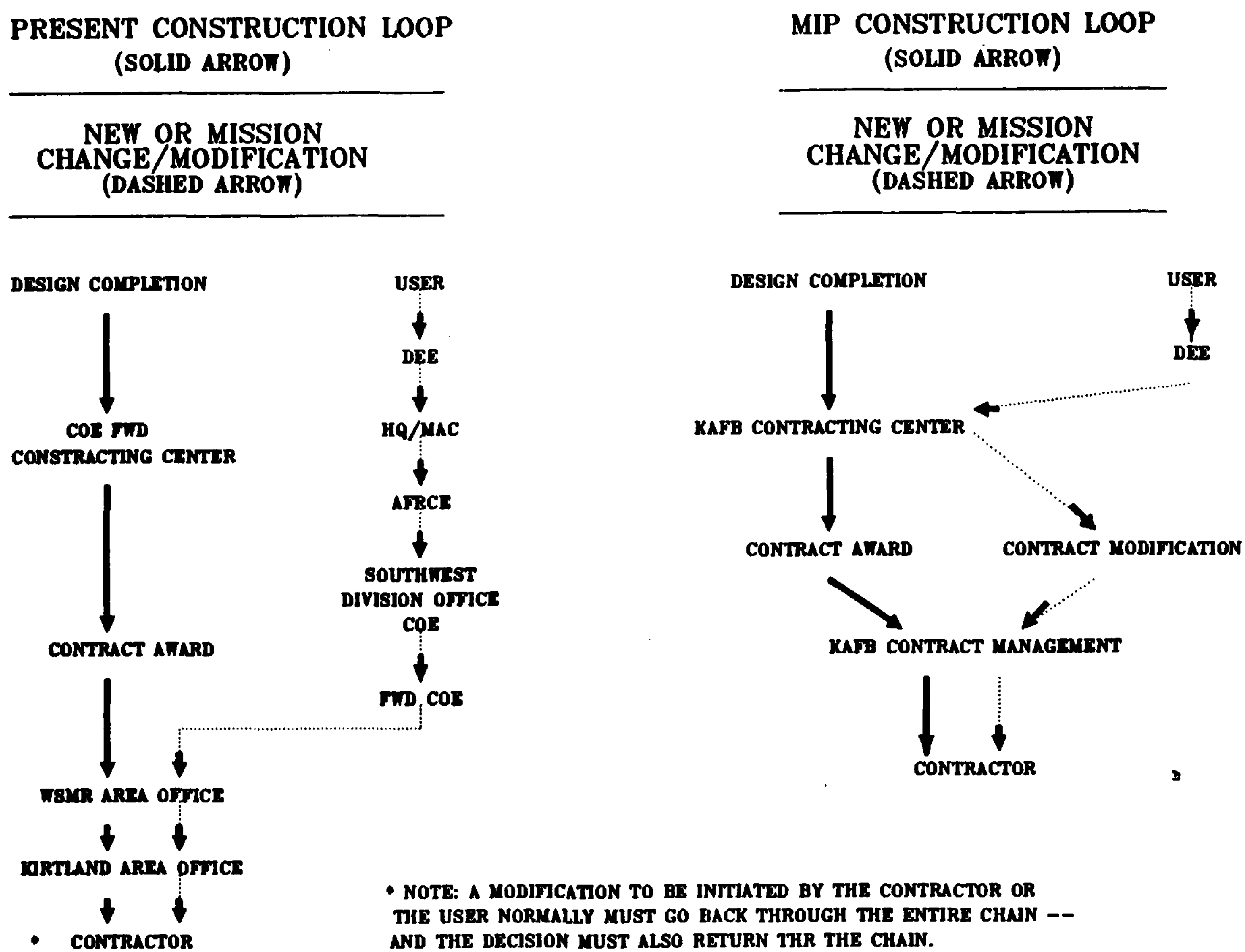


Figure 10. MCP Design Procedures (Traditional) - Kirtland AFB



• NOTE: A MODIFICATION TO BE INITIATED BY THE CONTRACTOR OR THE USER NORMALLY MUST GO BACK THROUGH THE ENTIRE CHAIN -- AND THE DECISION MUST ALSO RETURN THR THE CHAIN.

Figure 11. MCP Construction Procedures - Kirtland AFB

authority at the base level for the end product, which enhanced the main goal of this new office, responsiveness to the needs of the base and tenants (17).

The organizational structure of the new office originally consisted of three sections as shown in Figure 12. The office was headed by a chief with a staff of engineers, architects, contract administrators and inspectors. The office was located in the Engineering, Construction and Development Directorate directly under the chief engineer (1606th ABW/DEE). Management reassigned a permanent position from existing resources for the MCP office chief position. The other staff positions were filled with temporary hires for the duration of the MIP program. The actual number of employees hired fluctuated with the workload (35).

Projected management costs of the MCP office were estimated and compared to what would have been paid to the COE in the traditional setup. Figure 13 reflects the cost comparisons based on the projects selected by Kirtland AFB for the period of FY 85-88. The COE costs included the fixed Surveillance, Inspection and Overhead (SIOH) of 5.5 percent, and the estimated engineering overhead of 4 percent which was based on historical data of earlier projects managed by the COE. The Air Force costs were comprised of direct manpower expenses to fund 15 positions of varying terms in the MCP office and support/overhead costs such as wage escalation, supplies, transportation, etc. (35).

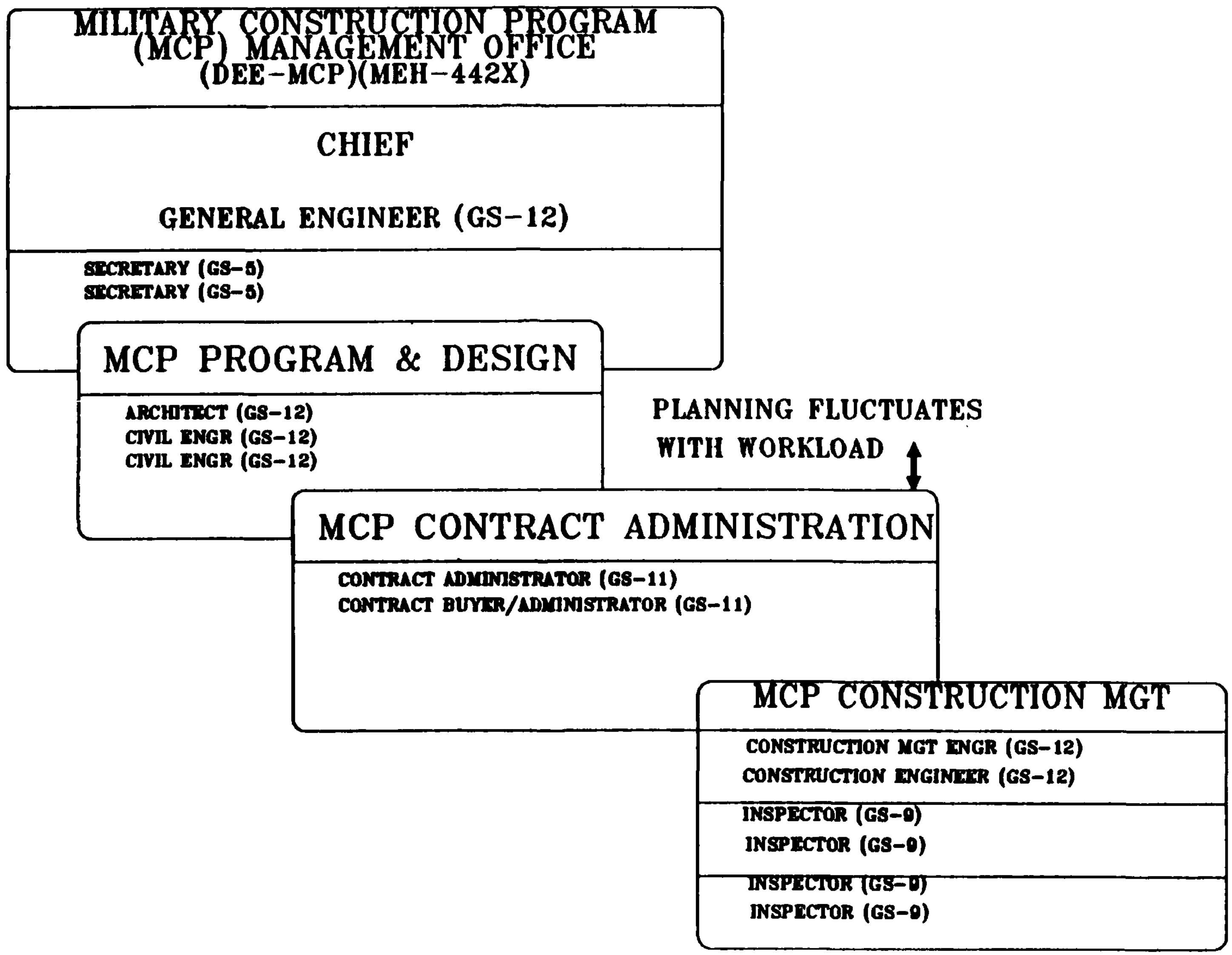


Figure 12. DEE-MCP Projected Manning - Kirtland AFB

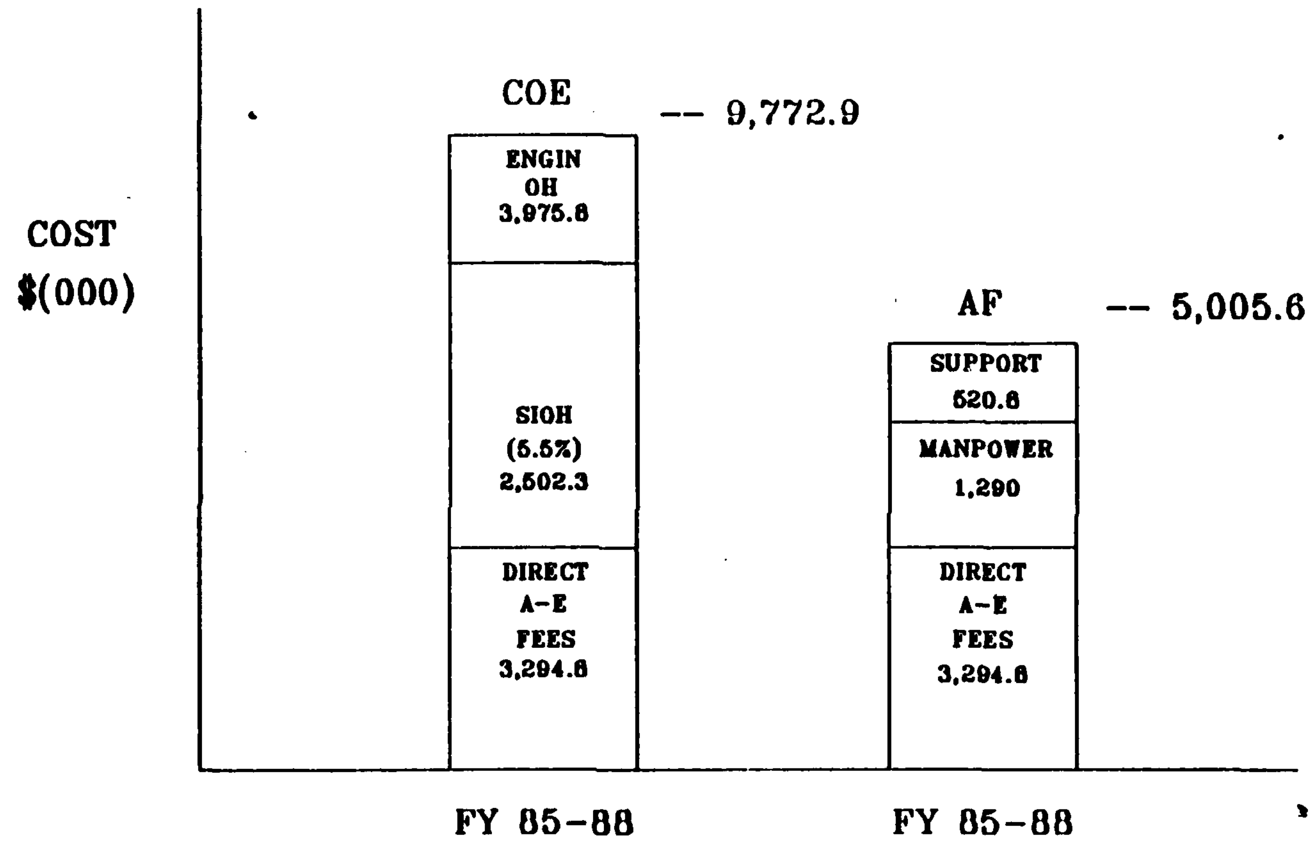


Figure 13. MCP Projected Cost Savings - Kirtland AFB

Both the COE and Air Force costs included A-E fees to design the projects. Total cost savings in Air Force management of the MCP program were estimated at $4.77 million. This projection does not include additional savings from the deletion of AFRCE involvement. The total savings would increase if AFRCE management costs were included (35).

The implementation plan also included the submission of another MIP proposal to waive AFM 172-1, Volume I, Paragraph 23-5(C) and (D). If approved, this would allow HQ MAC and the BCE to use MCP funds for manpower and overhead costs to manage MCP projects. In the meantime, the BCE requested "up front" funding for the MCP office from HQ MAC to support the hiring of personnel by 1 April 1985. HQ TAC had already provided such funding for Moody AFB (45).

By June 1985, the MCP office (DEE-MCP) was operational but lacking any permanent staff, since management was having difficulties in processing the required positions with base personnel. Therefore, engineers and architects were rotated through the office on temporary assignments of three months. This continued until April 1986 when the MCP office was established as a permanent entity reporting directly to DEE. The initial staff consisted of the chief/associate director, one programmer, three project managers, two inspectors, one secretary and one procurement officer as shown in Figure 14. The design and construction experience of this staff totaled 80 man-years. The positions in the MCP office were temporary and renewable on an annual basis (17, 35, 39).

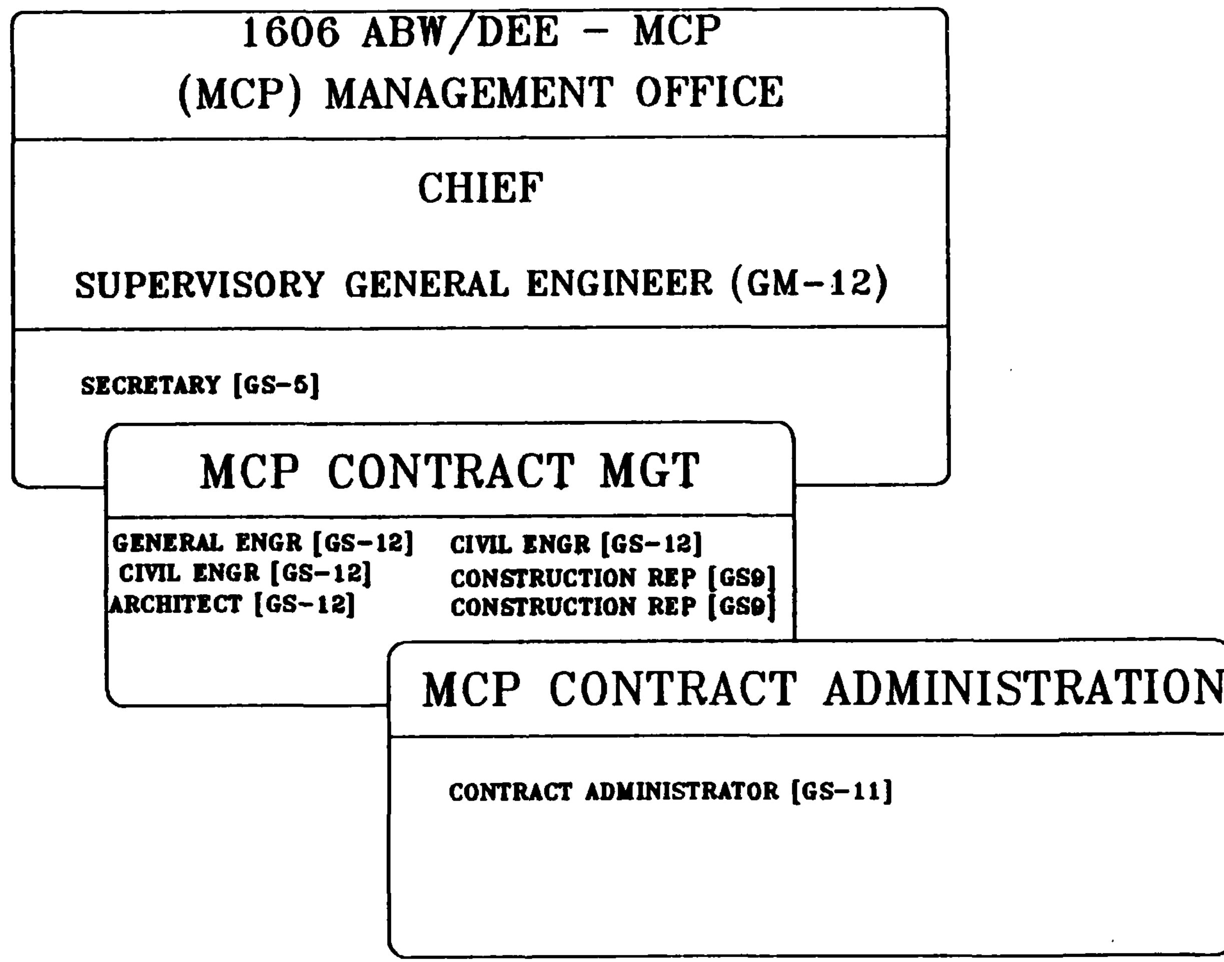


Figure 14. DEE-MCP Manning - Kirtland AFB

The MCP office's duties and responsibilities were identical to those at Moody AFB. However, Kirtland was not able to collocate contracting personnel with the engineering staff of the new office. The contracting officer remained in the base procurement office. Additional expertise and manpower support was obtained from the design and contract management branches when needed. Conversely, the DEE-MCP staff provided assistance to these design branches, if requested (9, 17).

The workload in 1985 and 1986 was fairly light, and consisted primarily of managing design activities for FY 86, FY 87 and FY 88 MCP projects. This was a transition period, while the COE was still completing design and construction of projects initiated earlier under the traditional setup. The MCP office handled construction management of smaller MCP projects such as the $1.3 million, Communication Duct System (Phase I) contract and the $880,000, ECIP (Energy Conservation Improvements Program): Energy Improvements contract during 1986. Both of these projects were fairly simple in design and construction and easy to manage during the establishment of the MCP office (17).

During the later part of 1987, many changes occurred in the program. The organizational structure of the MCP office was changed from being directly under the DEE to a section in the design branch under the DEEE. The mission of the MCP office was modified to include the management of other major efforts, such as large O&M, Non-Appropriated Funded (NAF)

and hospital projects. This resulted in the office being renamed as the Major Projects Office (DEEE-MP). The staff was reduced to four fulltime engineering/architectural positions, including the section chief, and two parttime positions for administrative help. However, a construction engineer and three inspectors in the Contract Management (DEEC) branch and a contracting administrator/officer and buyer in base procurement (AFCMD/PKC) still provided support to DEEE-MP. The four-person staff in DEEE-MP received permanent position status. All the positions were taken from civil engineering's (DEM) own manning, at no additional cost to HQ MAC. The DEEC inspectors utilized on DEEE-MP projects were selected based on their expertise. Various inspectors in the branch were rotated on MP projects at the discretion of the construction engineer. This reorganization provided a larger "pool" of engineers and inspectors to draw from and enhanced the cooperation received from DEEE and DEEC. Redundancies in duties and responsibilities between different branches were also minimized. The redesignation of the MCP office to the Major Projects (MP) office acted as a safeguard maneuver for the recently established program. If the MIP program to manage MCP projects was ever canceled, the MP office could continue to operate as a special projects section providing MCP surveillance and managing selected non-MCP projects. The new organizational setup is shown in Figure 15 (12, 17, 30, 35, 39).

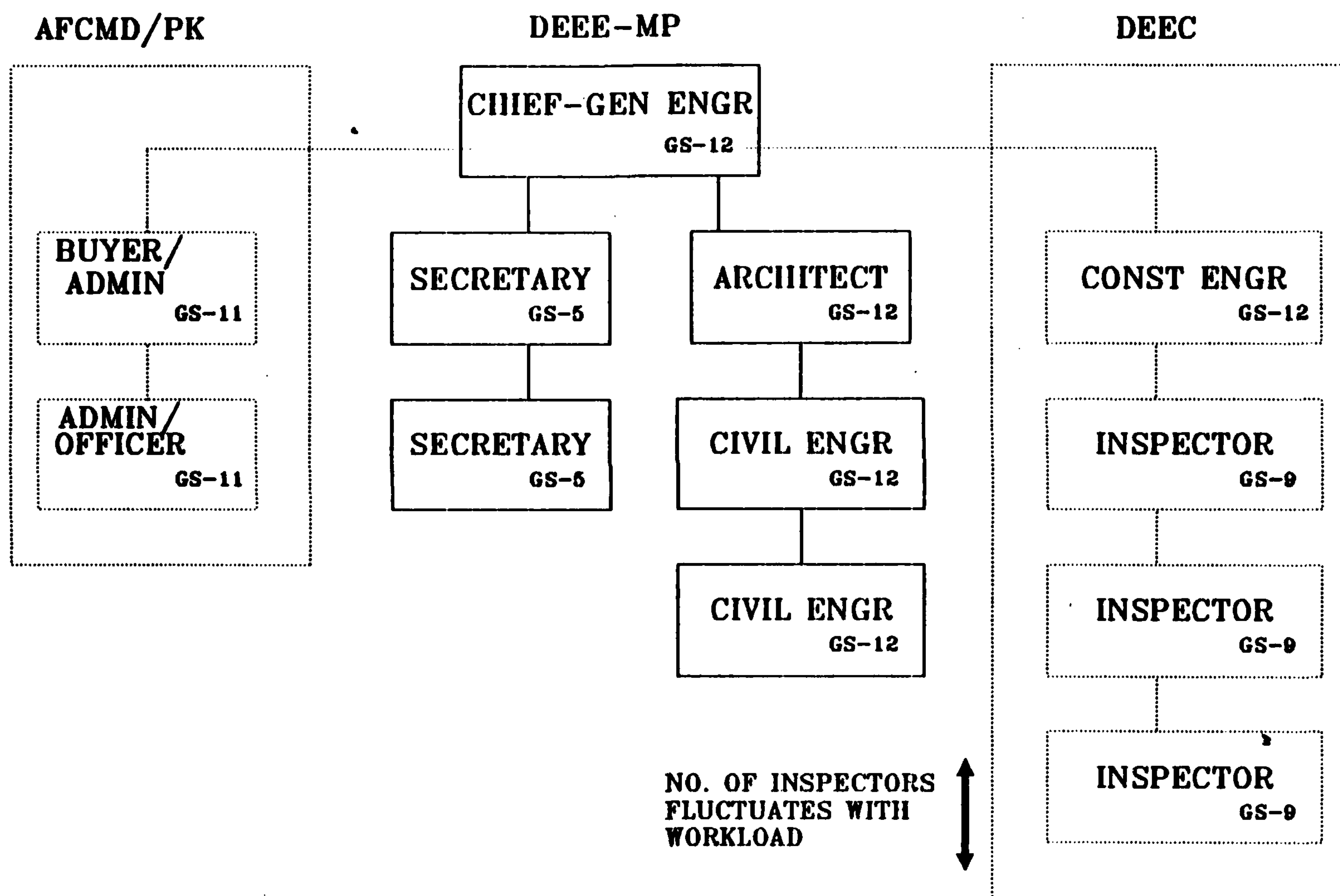


Figure 15. DEEE-MP Manning - Kirtland AFB

Presently, the DEEE-MP office is located at base civil engineering and continues to receive support from DEEC and AFCMD/PK. The four-person staff is a tight-knit organization with each engineer having a basic knowledge of all projects managed by the office. Individual project managers are assigned to each project to maintain continuity from programming through construction. The team concept is heavily emphasized by the MP office chief, Mr. Wes Furman, to provide the needed depth and coverage for a specific project manager that might be temporarily unavailable. This concept allows any individual in the office to make changes or decisions in a responsive manner with minimal wait time for the using agencies (17).

Difficulties/Challenges. The use of MCP funds for Air Force personnel and overhead costs proved to be one of the more lengthy and complicated problems. The use of MCP funds was originally requested in the form of the following MIP proposals, submitted in March 1985 to HQ MAC:

1. MIP Proposal No. 85MK0064DE (MCP Funds for Personnel Costs) - waiver request to AFM 172-1, Volume 1, to allow the Air Force to use MCP funds for personnel costs, similar to the COE/NAVFAC.

2. MIP Proposal No. 85MK0078DE (Transfer of MCP Funds) - request to transfer FY 85 and 86 SIOH funds to Kirtland AFB for projects already designed (45).

A review of the correspondence following the submittal of these proposals indicated confusion and often conflicting information from the higher management levels in the Air Force and DOD. Different interpretations of the existing

MCP funding legislation were encountered. An excerpt of a June 1985 memorandum from the Office of the Assistant Secretary of Defense (OASD) to the Deputy Assistant Secretary of the Air Force (Installations, Environment and Safety) stated:

> The only notification of Congress required by law is the notification that occurs as part of the annual report to Congress directed by subsection (b)(5) of 10 USC 2861. The Committees with the oversight of MILCON recognized that, in certain instances, the best interests of the taxpayer could be served when the Air Force or another agency is directed to manage a construction project. Congress provided the authority (10 USC 2851) and the notification requirement (10 USC 2861) ... although the legislative history on this subject is thin, there was no intent on the part of Congress to authorize and appropriate MILCON funds to build a project (including sufficient funds to accomplish SIOH), to authorize Air Force to manage construction on occasion, then to deny the Air Force the use of those MILCON funds to accomplish the authorized tasks [38].

However, HQ USAF/ACB informed Kirtland AFB that the use of MCP funds for Air Force personnel costs was illegal since no past legislation specifically permitted such use. Kirtland continued to pursue this funding dilemma and at the MIP Commanders' Conference held in November 1985, HQ USAF/LE and HQ USAF/AC agreed to seek MCP funding support for the MIP installations. HQ USAF/LE would assist HQ USAF/AC in drafting the necessary language for the FY 87 Appropriations Bill to allow the funding of Air Force personnel costs (17, 35).

In September 1986, after repeated inquiries by Kirtland into the FY 87 Appropriations Bill verbiage, HQ USAF/PRPJ issued the following message to all the major commands participating in the MIP program:

> The Air Force does not advocate the establishment of a third design/construction agency. Therefore, the reprogramming action to allow the management of FY 87 projects to be funded using design funds (P313) has been dropped. Air Force bases that have been granted waivers based on subject MIP requests to be their own design/construction agent (Kirtland, Moody, Hickam, Whiteman, and Reese AFBs) cannot use Military Construction Program (MCP) funds (P313) to pay for supervision, inspection and overhead for FY 87 and prior year projects. However, they are authorized to charge the cost of soil and topographic surveys, architect-engineer design services and actual construction contracts to military construction. All other associated costs of the management of MCP projects are to be charged to Operations and Maintenance (O&M) funds. Fiscal year (FY) 88 and beyond projects should be programmed and budgeted by the bases through the Program Objective Memorandum (POM) cycle to use MCP design funds (P313) for the management of their projects [27].

Despite the decision by HQ USAF, Kirtland AFB decided to continue the MCP Management Office, using the base's O&M funds. The suggestion to program and budget through the POM cycle for MCP design funds proved unfeasible. The earliest Kirtland would be able to identify these funds was for the FY 89 and FY 90 programs. At that time, the MIP program would be expired. Without the MCP funding for management costs, civil engineering felt a fair test could not be conducted at the MIP bases. The BCE argued that without the same funding provided to other government agencies such as the COE, Kirtland would be unable to truly test their expertise and show any valid cost savings (35).

The processing of the personnel positions for the new MCP office proved to be difficult and delayed the establishment of the program. Justification for position

grades and the number of manpower slots became such a problem that the chief engineer eventually submitted a MIP proposal requesting authority for civil engineering to determine the type and quantity of personnel positions required (17).

After Kirtland established the MCP Management Office was established, some difficulties were encountered in meeting critical milestones for the FY 87 projects. The problems were primarily attributed to the following reasons:

1. Learning curve--civil engineering's lack of knowledge of certain HQ MAC deadlines which were accelerated at times with short notice.

2. Lack of adequate communication with HQ MAC.

3. Difficulties with the base personnel office, manpower and the temporary nature of positions in establishing the MCP office.

4. Difficulties with base procurement in the solicitation and awarding of contracts.

5. Funding delays resulting from the Gramm-Rudman-Hollings Bill (9, 16, 17, 35, 39).

The problems with timeliness focused mainly on the three out of five FY 87 projects that were not awarded during the same fiscal year as they were funded. However, these three projects were awarded before the end of the first quarter of the second funding year.

Civil engineering and base procurement considered the three delinquent projects to be fairly complex in design. Both agencies decided to give contractors adequate time to accurately bid the projects. This would hopefully result

in a smaller number of modifications. What did result during the construction of these three projects was a record of no work stoppages or delays due to modifications. Additionally, base procurement (AFCMD/PK) established a "tiger" team to personally handle the contracting process for all major construction projects at Kirtland. Civil engineering also scheduled monthly meetings to project the upcoming workload and suspenses (35).

HQ MAC expressed much concern over the performance of the MCP Management Office and offered the following observations in a 26 February 1988 message to HQ USAF/LEE:

> 1. Kirtland's performance as design and construction agent has generally not met established goals for timeliness. Thirty-eight percent (5 of 13) of FY 86-89 projects designed by Kirtland missed the 35 percent schedule milestone and 71 percent (5 of 7) of FY 87 projects were not under construction by 30 September 1987 of the fiscal year.
>
> 2. Kirtland's design management performance has been adversely affected by competing base-level demands on in-house engineering manpower which was not augmented or increased over the long term when the design/construction agent role was assumed: by a strong willingness to accommodate user changes which delayed design completion and because the base is corporately still on the learning curve of MCP engineering/construction execution.
>
> 3. The quality of the "finished product" cannot be adequately and accurately assessed. While we have some concerns over Kirtland's early expenditures of contingency/management reserve funds for two specific projects, we do not yet have sufficient data to adequately assess Kirtland's construction management [20].

The message went on to discuss HQ MAC's repeated concern for timeliness in addition to the main objectives to provide quality facilities and to demonstrate the Air Force capability to provide superior management of selected MCP projects. In that regard, HQ MAC proposed the following steps to better insure future success of the program:

1. Since Kirtland absorbed the role of MCP design and construction management with no additional sustained manpower or funding, HQ MAC/DE will make the decision on which MCP projects Kirtland will manage. This is particularly relevant and necessary as we face severe O&M funding reductions causing civilian pay constraints, options for early retirements and a command-wide civilian hiring freeze.

2. HQ MAC will become the design and construction manager for projects which Kirtland becomes the agent. Request you change Point of Contact (POC) access to accommodate this shift of responsibility.

3. There needs to be formal establishment of more definitive and quantitative "measure-of-merit" than currently exist as a yardstick of success for Kirtland's performmance under the MIP test. We will develop and implement HQ MAC criteria for future evaluations of Kirtland's performance. Together with a structured evaluation schedule and a process which will balance considerations of timeliness, quality and cost management. We should continue the MCP management test but with a stronger HQ MAC focus and involvement in workload acceptance and performance evaluation [20].

Kirtland expressed extreme concern over the HQ MAC/DE message to HQ USAF/LEE which appeared to indicate a unilateral decision had been made on the part of HQ MAC to transfer design and construction management responsibilities from wing level (1606th ABW) to headquarters level (HQ MAC). In addition, no coordination was made with either the wing commander or the Base Civil Engineer. In a 8 March 1988

message to HQ MAC, Kirtland reiterated some of the reasons for the earlier slippage in the program and actions taken to insure future MCP dates were met or exceeded. The message went on to outline the following issues:

1. The civil engineering staff does accommodate local user changes in keeping with the wing's mission to support the customer. Most of the MCP program involves technical AFSC R&D projects with the expertise at Kirtland. We only do the changes that result in a better and product. Changes after contract award have been kept to minimum.

2. The original intent of the MIP was to eliminate most of the layers of management and let the lowest possible level work the projects. Elevating this authority to HQ MAC will result in additional time for project reviews, coordination, and add increased time to project execution. This seems contrary to the professed shortcoming--taking too much time.

3. If the decision is made by HQ USAF/LEE to appoint HQ MAC/DE as the MCP design/construction manager in *lieu of Kirtland AFB, the wing* will have to reconsider the participation of Kirtland in the test program. The additional time required for HQ MAC/DE decisions defeats the original intent of the MIP proposal to allow Kirtland to selectively mange their MCP program. Electing to return the MCP program to the COE before all factors are considered would be a major setback to the MIP program and the idea of decentralized management.

4. Kirtland is still the number one MIP base in the USAF. Over 150 of Kirtland's proposals have been adopted AF wide--we are changing the way we do business [47].

A 28 March 1988 message from the Vice Commander of MAC (CINCMAC/CD) to the Wing Commander of Kirtland (1606th ABW/CC), stated that HQ MAC involvement in the MIP program was to facilitate the performance of the MCP management at base level. No redesignation of design and construction

management responsibility was authorized from wing to headquarters level. The message went on to propose the continuation of the MCP management by Kirtland with stronger HQ MAC/DE involvement. Return to the traditional system of total COE control was not recommended (35).

The coordination of projects with procurement (AFCMD/PK) proved to be a stumbling block. When the MCP Management Office was first established, BCE funded a contract buyer/administrator slot in procurement. However, the filling of this position proved difficult due to the temporary nature of the job. Therefore, many of the earlier projects (FY 85 and FY 86) were delayed as procurement attempted to manage both the Real Property Maintenance and Construction (RPMC) and MCP projects with the same staff. In early 1987, base procurement filled the contract administrator slot which was dedicated solely to MCP projects (17, 39).

The DEEE-MP staff provided the following reasons for the difficulties encountered with procurement:

1. Base procurement was under a different command, AFCMD, than the BCE. Each organization reported to different commanders with different priorities, goals, and mission.

2. Procurement procedures too rigid for MIP program.

3. Turnover among contracting personnel during MIP program.

4. Base procurement's unfamiliarity with the MCP program and the larger, more complex projects.

Many of the problems associated with procurement in the Air Force management of MCP project also existed on the non-MCP projects. However, the reprioritization of civil engineering projects helped minimize the problems experienced earlier with the FY 86 and FY 87 projects (9, 17, 18, 39).

Effectiveness in Areas of Concern. As in the case study of Moody AFB, the civil engineering organization at Kirtland was evaluated in the following MCP problem areas: customer satisfaction, project management, project turnover/warranty and quality of work life. The following discussion addresses the performance of Kirtland in each of these areas based on interviews, field visits and review of documentation.

Customer Satisfaction. The two using agencies interviewed, AFOTEC and AFWL, expressed greater satisfaction with the new MCP setup as compared to the traditional setup. The agencies regarded the reduction in layers of management as playing a key factor in the excellent user relations experienced in the MIP program. Five levels of "paper handling" were eliminated with the MIP program: HQ MAC (MAJCOM), HQ USAF, AFRCE-Central Region, COE-Southwest Division and COE-Fort Worth District. These layers of bureaucracy and the geographical separation of agencies that existed prior to the MIP program, made user input difficult during both design and construction. Under the MIP program,

users felt face-to-face contact between the user and the MCP managers became much easier. This was primarily a result of the proximity of the BCE who acted as the design and construction agent. In addition, the fact that only two agencies were involved in the decision making accelerated the time required for reviews and changes. Mr. James Wilson, Director of Resource Management, AFOTEC, expressed that "there was no doubt about the excellent responsiveness of civil engineering to user needs in the MIP program." He went on to describe the DEEE-MP support as "super," especially during the construction phase of the Construct Computer Vault project. Wilson indicated the daily contact between the user and the DEEE-MP staff greatly enhanced the final product. A good example of the support provided was the formation of the Configuration Control Board. This was a committee of selected individuals from the various base organizations (DEEE-MP, fire department, security, communications, etc.), the A-E designer, the A-E inspector, and the contractor. The concept for this board grew out of Bohannon's desire to emphasize close communication with users, especially on highly technical projects. The board met once a month during the life of the project. The group was very action-oriented, and concentrated on resolving various types of problems or simply identifying potential problems. The members of this board were able to actually agree on particular actions in the meeting without having to wait for authorizations (59).

Other areas where the user expressed satisfaction included the architectural aesthetics and compatibility of the new facility, the selection of the A-E and the procedure used by the base in procuring the subject contract. The aesthetics of the facility were directly attributable to the architectural emphasis of the DEEE-MP staff. The selection of a qualified, local A-E was considered important in maintaining the face-to-face contact desired by the using agency and the needed expertise for the unique facility. Lastly, the procedure selected to advertise the project was identified by the user as critical in the certification of the completed building. According to Wilson, the base had encountered problems in certifying specialty buildings for a variety of reasons. These buildings included R&D labs, weapons testing and storage facilities, etc. Therefore, it was decided by the user, DEEE-MP and procurement that the Request for Proposal (RFP) would be more appropriate for the Construct Computer Vault project. This decision was based on the peculiar nature of the facility which involved sophisticated security measures. What resulted from these actions was a smoother construction phase and a functional facility that met the needs of the user (59).

Despite the successful management of the Construct Computer Vault project during construction, AFOTEC did identify certain problems during the design phase. According to Wilson, the highly technical vault facility was inadequately designed by the original A-E. The project

consisted of extensive shielding, grounding and electronic communication for the construction of a secure operating facility to process classified items. During the construction of the vault, the new grounding system of the facility was identified as defective. However, the original A-E was not held liable by DEEE-MP and procurement since the original design was approved by all government agencies involved. The user felt the staff of DEEE-MP should have been increased with additional expertise in the electrical engineering area to possibly avoid such problems. AFOTEC also expressed concern over the tight manning of the DEEE-MP section (59).

Another area of concern was the on-going design of the $3.2 million, OTE Complex Addition project. The user expressed frustration with the increased involvement of HQ MAC/DE in the design of the project. Although the DEEE-MP staff was responsible for the management of the project, HQ MAC/DE dictated the design priorities in lieu of the base or user. AFOTEC voiced concern over the delays caused by HQ MAC/DE, which earlier had minimal involvement in the nearly completed Construct Computer Vault (CCV) project. The CCV project proved significantly more complex than the OT Complex Addition. As mentioned earlier, this involvement by HQ MAC was a result of the slippage of FY 87 projects experienced by the base (59).

Project Management. The management of MCP projects in the MIP program showed marked improvements in the areas of

changes and reviews. Although many of the major projects are still under construction, some data was available of FY 86 projects either completed or near completion. As mentioned earlier, the slippage in the design and procurement milestones did raise concern over the base's performance in the project management area. However, many of the missed milestones were attributed to the following reasons: personnel problems encountered in establishing the MCP office and the desire of the base to thoroughly review the more complex projects to avoid future changes during construction.

In March 1988, the contract modification rate in dollars was 2.3 percent of the total bid price as compared to the COE rate of 12 percent for MCP projects at Kirtland. This improvement was a result of the following actions taken by the base during design:

1. Establishment of a comprehensive ratings system for A-E selection on MCP projects.

2. Strong emphasis on involving using agency in design input.

3. Keeping design of new facilities "in tune" with the Base Architectural Compatibility Plan.

4. Single project manager for the life of the project.

5. Thorough reviews of A-E design.

6. Support from design and contract management branches (35).

The reorganization of the MCP management office removed the construction engineers and inspectors from the new

DEEE-MP staff and placed the individuals in the Contract Management Branch (DEEC). This move actually resulted in strengthening the inspection of MCP projects with the maximum use of existing inspectors in the civil engineering organization. A greater variety of expertise could now be combined to inspect projects. Also, manning of projects was no longer a problem since inspectors handling O&M projects could be used when the O&M workload permitted. With this increased inspection capability and experience, the inspection of projects was definitely enhanced. Many of these benefits were intangible but resulted in smoother management during the construction phase (12, 17, 35).

A recent example of the improved project management under the MIP was project No. 860101, Communications Duct System/Phase I. With in-house inspectors making daily visits to the job site, potential problems were identified and resolved quickly before becoming major problems. This particular project involved excavation work around countless, existing utilities. This posed significant problems especially when existing utilities were not indicated on the design documents. The inspectors had immediate access to project managers, maintenance shops and using agencies which resulted in quick analyses of problems and the development of solutions. The likelihood of claims by the contractor due to government caused delays was then minimized. What resulted was the early completion of the subject project 2 months prior to the scheduled completion.

In addition, not one change order for an increase in construction cost existed. In fact, one field change identified by the construction inspector resulted in the reduction of the construction cost by $10,000 (12, 17, 35).

Project Turnover/Warranty. The number of projects actually completed was few in number. Therefore, an evaluation of the base's performance in this area of concern would be difficult and possibly not representative. However, with the cradle-to-grave concept for project management, where a single engineer/architect was responsible for a project from programming to completion of construction, the turnover and warranty problems normally encountered should be minimized. Under the old system, the turnover of a project involves COE coordination with the BCE shops, inspection and real estate personnel. In addition, the BCE becomes responsible for any warranty problems of a facility constructed by the COE. However, under the MIP program, a vested interest exists in all designs handled by DEEE-MP. Unlike the COE, the DEEE-MP staff must still maintain and interact with the users of the new facility for its remaining life. The BCE is unable to walk away from the project once it is completed (9, 12, 17, 35).

The MCP office also has planned to conduct post-occupancy evaluations with the tenants to determine if their needs have been satisfied. This will enable the BCE to learn from the experiences gained in the MIP program and possibly help in future decisions (18, 35).

Quality of Work Life. The "pride of ownership" was quite evident at the civil engineering organization. The staff engineers stated, "Under the old system, we felt like we were just processing paperwork ... whereas, we now feel like we can contribute our talents to the program." The experience gained from working on the larger MCP projects, as compared to the usual base workload of RPMC projects, proved to be an intangible benefit for those involved in the program (9, 12, 16, 17, 39).

The institution of permanent positions for the DEEE-MP staff was a definite morale booster. Employees were no longer distracted by the temporary nature of the job. Additionally, this action by management to obtain permanent status for the staff somewhat assured the program of better continuity. This was evidenced by the fact that during the life of the program, no turnovers occurred in the engineering staff. Longevity of the employes were potential indicators of job satisfaction. Additionally, interviews of all those involved in the program indicated the desire to continue the program with possible Air Force-wide applications (9, 12, 17, 39).

Cost Effectiveness. The savings realized from the Air Force management of the MCP program at Kirtland were not as apparent as in the case of Moody AFB. This was largely a consequence of Kirtland not establishing separate cost centers for the MCP staff. The projected $4.77 million savings estimated earlier was based on a 15 person MCP

organization in civil engineering. However, Kirtland decided to use a four person staff with inspection and contracting assistance from the Contract Management (DEEC) and Procurement (AFCMD/PK) offices, respectively.

Realistically, the actual cost savings was difficult to determine due to the existence of numerous intangible benefits. Mr. Wes Furman probably summed up the benefits of the MIP program best when he described the cost savings as "a lot more bang for the buck!" (17).

Organizational Effectiveness

The Air Force civil engineering organizations reviewed in this case study were effective in many areas of the MCP process. Based on the organizational theories of Steers, Campbell, Zammuto, and Peters and Waterman, the MCP programs at Moody AFB and Kirtland AFB epitomized many of the traits associated with organizational effectiveness. This evaluation was predicated on the following characteristics that represent an effective organization:

1. Adaptability-Flexibility - The MIP program allowed the two bases to be more flexible and adaptable. Existing regulations and policies could be waived to allow the base to implement innovative ideas. The ability of the MCP management staff to adapt their organization to changes in the work environment exemplified this concept. Examples were given in Chapter 4 where Moody AFB civil engineering made organizational changes in establishing the MCP office in the form of collocation and requesting outside A-E technical expertise. These ideas provided the flexibility for the management of projects not usually found in the traditional

MCP and O&M setup. The collocating of contracting personnel with the engineering staff was a new concept in managing projects and provided the project-orientation desired. Both civil engineering organizations also emphasized the team concept. This was made possible with the development of a independent organization. The staff size would increase or decrease with the fluctuations in the workload. A-E technical assistance was utilized when the workload was excessive or if the engineering staff was unable to resolve a particular problem.

2. Responsiveness to Constituents - Both programs demonstrated increased improvements in customer responsiveness. The reduction of layers of management in the MCP process down to only the base and major command provided the user with a more direct access to the agencies managing the projects. projects. Earlier, users had to contend with a minimum of 4 agencies. At Kirtland AFB, a Configuration Control Board was established to improve responsiveness to the users. The board met monthly with the users and worked to resolve existing and potential problems. Increased communications and face-to-face time with the user resulted from Air Force management of the MCP program.

3. Productivity - The discussion on cost savings indicated the two MCP offices were able to manage the MCP projects more cheaply and with less manpower. The Moody MCP office was able to document savings of 2-3 percent in management costs when compared to the COE. The exact savings at Kirtland were more difficult to verify since no separate cost centers were established. The exact savings in both cases are approximations since many additional, hidden savings existed with the implementation of the MIP program. The comparison was based on the past historical data of COE management costs.

4. Goal Optimization - The realization by the civil engineering organizations that goal maximization would be difficult was critical in maintaining the well-being of the program. Rather than just pursuing the goal of cost savings through Air Force management, the two MCP offices also emphasized other areas such as functionality of facility design, base architectural compatibility, customer

responsiveness, employee job satisfaction and shop involvement. Initially, customer responsiveness and cost savings were the two factors used in justifying the MIP proposal to allow Air force management of the MCP program.

5. Action-oriented - Both organizations displayed action-oriented staffs with the accent on total responsibility of each MCP project by the entire staff. The traditional transferring of responsibilities between different agencies or branches did not exist in the MIP program. Each MCP office attempted to resolve problems within their own staff rather than depending on other civil engineering branches. This resulted in minimizing delays or work stoppages on projects due to circumstances outside their control.

6. Job Satisfaction - The morale of employees in the MCP offices appeared to be very high for the following reasons: 1) challenging projects, 2) higher pay grades, 3) MCP work experience gained, and 4) reduction of "bureaucratic" levels of management in the MCP cycle. The opportunity for the MCP office staff to work on the larger and more challenging MCP projects was the biggest factor in the increased job satisfaction witnessed. The absence of any turnover in employees during the program except for the departure of term employees also attest to the improved job satisfaction of the workers.

The organizational effectiveness of the MCP offices at both Moody and Kirtland AFB can hardly be questioned. Some areas for improvement do exist, especially at Kirtland, in the areas of interfacing with other agencies. However, the results clearly indicate that both bases were able to develop effective organizations for the management of MCP projects.

V. Conclusions and Recommendations

The purpose of this case study was to evaluate the Air Force civil engineering organizations presently managing the Military Construction Program. These organizations have assumed design and construction agent responsibilities without the traditional intermediary agency such as the Corps of Engineers. This conclusion presents the management initiatives, strengths and weaknesses of the MCP programs at Moody AFB and Kirtland AFB. Recommendations are then provided to assist other bases in establishing Air Force managed MCP programs. The following conclusions and recommendations presented are based on interviews, office records, data from management information systems and on-site observations of the civil engineering organizations.

Conclusions

The results obtained by the civil engineering organizations at Moody AFB and Kirtland AFB proved that the Air Force could manage MCP projects more effectively than the Corps of Engineers. When the records of MCP projects managed by the Air Force were compared to historical records of COE managed projects, no doubt remained as to the success of the program. Unfortunately, the program was not continued at Moody AFB due to the lack of funding from HQ TAC. At Kirtland AFB, the program continues and is

aggressively managing over $25 million in MCP projects. No MCP funding for Air Force personnel and support cost is anticipated in the near future. The following discussion summarizes the influential actions taken by the organizations involved that enabled successful Air Force management of the MCP program. This is followed by a discussion of the program strengths and weaknesses and the necessary steps required for other Air Force civil engineering organizations to establish a successful MCP program.

Management Actions. The participation of the bases in the Model Installation Program provided the foundation in which the concept of the Air Force managing the MCP program was developed. Within the framework of the MIP program, the bases submitted various proposals to change the traditional setup of managing MCP projects. One of the more significant proposals, after authorization was received by the bases to assume the COE responsibilities, involved the deletion of the AFRCE from the MCP cycle. This enabled the bases to have the flexibility and freedom needed to manage the program.

The key managers involved in establishing the program provided the impetus to overcome many of the difficulties encountered. The well-planned implementation of the Air Force MCP program by these managers was crucial to the success of the program. Most notable of the difficulties were the processing of the new positions with base personnel

and manpower and the use of MCP funds for Air Force management costs. Of the management actions presented in the research findings, two stand out significantly in contributing to the effectiveness of the program: establishing an independent, project-oriented MCP office and the collocation of contracting personnel with the engineering staff. The management decision to create a separate MCP office established the framework in which innovative management ideas were conceived and practiced.

The project-oriented management of projects was one of these ideas. This enabled the bases to have continuity throughout the life of a project. A project manager was assigned to a project to be responsible from cradle-to-grave. This eliminated many of the common start-up problems associated with the previous system.

The team concept, in which engineers of various disciplines were located in the MCP office, expedited the handling of problems during design and construction. The independent office also allowed the MCP office staff to focus exclusively on the management of MCP projects. This prevented the wide fluctuations in workload commonly experienced in the fiscal year funding of O&M projects. Hiring of experienced personnel in the MCP process was wise since only a small transition period was required for training and familiarization.

The collocation concept utilized at Moody AFB appeared to have the most significant impact on the effective

management of the MCP program. This concept established a united work force in engineering and contracting. Although the traditional chain of commands remained, they provided only guidance, since the MCP office continued to act as a separate entity. The typical engineering and contracting interface problems were eliminated with the collocation. No "finger pointing" or lengthy written responses between the two offices existed. Instead, the contracting and engineering personnel approached the management of MCP projects as a team and worked together to resolve problems. The sharing of knowledge between these two offices facilitated the review and change process during both design and construction The contracting personnel were also able to focus on MCP projects with the collocation concept, which eliminated any outside distractions. The concept was so highly regarded by the management at Moody AFB that it is presently being employed on non-MCP projects.

<u>Program Strengths</u>. When considering the cost savings of Air Force management versus COE management of MCP projects, the interesting fact is that most of the significant benefits were intangible. The savings from these intangible benefits were hidden, but proved far more valuable from the perspective of all those involved in the program. These intangible benefits included the following: increased responsiveness to the user, a more direct line of communication between the user and the MCP manager,

increased face-to-face contact between agencies, closer coordination with BCE maintenance shops, more functional facilities for base tenants, improved architectural compatibility with base design theme and improved job satisfaction among personnel involved in the program. Other hidden savings included the lower bids received, due to the use of Air Force specifications in lieu of COE specifications; the reduction of conflict and delays among the Air Force agencies involved, since the number of outside agencies were reduced; and the lower overhead costs with the elimination of surveillance agencies such as the AFRCE. The actual cost savings were estimated at two-three percent of the contract amounts at Moody AFB and approximately three-four percent at Kirtland AFB. The actual cost savings at Kirtland AFB are still incomplete, since the majority of the Air Force managed MCP projects are still under construction.

The day-to-day actions of the MCP offices provided the impetus to the overall effectiveness of managing the program. The more significant of the initiatives included the following:

1) Assignment of individual project managers to contracts from inception through construction.

2) Thorough reviews of design packages performed jointly by contracting and engineering staff to reduce changes and delays.

3) Establishment of control boards comprised of users and key base personnel on complex projects.

4) Extensive A-E selection process using weighted factors in the ratings.

5) Hiring of engineers and inspectors with technical expertise for particular projects.

6) Use of outside A-E technical expertise to resolve difficult problems on projects.

7) Processing changes during design and construction with in-house MCP staff or A-E.

As pointed out by the civil engineering management at Moody AFB and Kirtland AFB, the job of managing the MCP projects was much easier under the MIP program. The base was no longer simply another layer of management in a multi-layered organizational hierarchy. The decentralization of authority now allowed the base to be directly responsible for the MCP program. This instilled a feeling of "pride of ownership" among the base personnel involved in the program and also allowed the base to focus and improve on problem areas such as customer satisfaction, project reviews and changes, project turnover and warranty and the quality of work life of those involved. What resulted was cost savings, more functional facilities, increased customer satisfaction, decrease in the modification rat, easier project turnover and warranty enforcement and increased worker morale among those selected for the program. The bottom line is the Air Force managed MCP program produced a

better product as a result of this increased involvement and "ownership" by the civil engineering organizations at Moody and Kirtland AFBs.

Program Weaknesses. The research findings did indicate some vulnerable areas in the management of the MCP program at Moody and Kirtland AFBs. The more notable weaknesses included the following areas:

1. Base Procurement - At Kirtland AFB where collocation was not employed, a lack of communication between civil engineering and procurement existed. Priorities of MCP and non-MCP projects conflicted and resulted in delays in the solicitation and awarding of contracts. In addition, turnover among procurement personnel handling MCP projects impacted the effectiveness of the program.

2. Base Personnel Office - The process of requesting new positions for the MCP office was severely hampered by the requirements of base personnel. Ironically, this traditional regulatory role of outside agencies was exactly what the MIP program was attempting to eliminate in the MCP process. The BCE was constantly defending and justifying position and grade requests despite the program's record of substantial cost savings to the government.

3. Personnel and Support Funding - The inability of senior Air Force management to procure MCP funding for Air Force personnel and support costs severely impacted the program. The model installations managing MCP projects were faced with the use of O&M funds for the MCP office. This affected the overall effectiveness of the program especially in major commands where various organizations were competing for limited funds. Repercussions were especially felt in the areas of manning and in-house design. The bases were discouraged from attempting in-house design since this would result in additional expenditures of O&M funds. A-E design fees were allowed to be reimbursed with MCP funds. The temporary nature of the positions in the MCP office staff due to the use of O&M funds made recruitment difficult especially for qualified contracting personnel.

4. Learning Curve - Like any new program, those involved in the Air Force management of the MCP program were faced with learning a new system of managing projects. Initially, problems were encountered with the milestones of the MCP projects at Kirtland AFB. Unfamiliarity with the more complex MCP design phase resulted in delays in the solicitation and awarding of several projects. This problem was compounded by the difficulties encountered with base personnel (DPC) and procurement (AFCMD/PK).

After reviewing and analyzing all the information collected during the case study, the following discussion will focus on the key assertions concerning the implementation of an effective Air Force managed MCP program. These key assertions may possibly provide the basis for further study and are as follows:

1. Upper management's support at both the base level and major command level is critical to the success of implementing the management of the MCP program at the base level. Senior management in the civil engineering organization plays a key role in developing the proper plans for the establishment of the MCP office.

2. The most effective action to successfully manage the MCP program in Air Force organizations is the establishment of a separate and independent MCP Management Office in civil engineering. This enables those involved in the program to have the flexibility and freedom to implement innovative ideas to handle the more complex and costly MCP projects.

3. Collocation of engineering and contracting personnel in the MCP office is an effective organizational structure for managing MCP projects. This concept could be applied to non-MCP projects in civil engineering as well.

4. The intangible benefits gained from the Air Force management of MCP projects far outweigh the cost savings realized. Improvements in the areas of customer satisfaction, design and construction management, project turnover and warranty and the quality of work life attest to the importance of acknowledging these intangible benefits.

Recommendations

This final section presents recommendations to other Air Force civil engineering organizations that are considering the assumption of design and construction management responsibilities in the MCP program. These recommendations are based on the research findings of this study. The relevancy of the actions taken by Moody AFB and Kirtland AFB are evaluated with respect to their applicability to other civil engineering organizations.

1. The first and most critical step in establishing an Air Force managed program is to acquire top management support of the respective base and major command. Once this is secured, all levels of management in the organization should establish a clear commitment to the program.

2. The benefits of the program must be presented to all those impacted. Presentations describing the cost savings and the tangible and intangible benefits to be realized from such a program must be stated.

3. A team, consisting of the key managers in the attached organizations, should be formed to develop the necessary plans for implementation. A well thought-out plan with milestones for the program must be developed to promote the necessary growth and guidance.

4. The establishment of an independent MCP Management Office with a single chief or director is important. This will provide the flexibility and freedom to manage the more complex and costly MCP projects. The size and type of staff will depend on the volume of work and the type of projects. Various disciplines of engineers are recommended to allow the office the needed diversity to handle a wider range of problems. Use of outside A-E technical assistance is recommended for problems beyond the MCP office's expertise.

5. Collocation of contracting and engineering personnel is strongly recommended to maintain the project-oriented nature of the office. This will also reduce unnecessary delays between offices in resolving problems.

6. Implement innovative ideas in the management of MCP projects. Solicit user involvement in all phases of work to secure the most functional facility for the user's needs. Establish control boards on more complex projects consisting of "key players."

7. Publicize the results of the MCP management effort. This will motivate those involved in the program to continue their efforts in effectively managing the program. The publicity will also encourage top management to continue the effort and possibly improve COE/NAVFAC relations at other Air Force base.

Summary

This case study of the two Air Force civil engineering organizations involved in managing the Military Construction Program in lieu of the U.S. Army Corps of Engineers examined the development and results of the two programs. Both programs have shown that the Air Force is capable of managing MCP projects more cost effectively. In addition, several tangible and intangible benefits resulted from Air Force managed MCP programs. These achievements by the civil engineering organizations at Moody AFB and Kirtland AFB should be strongly considered as potential alternatives in managing the MCP program.

Appendix A: Personal Interview Questionnaire

The following form was used for all personal interviews during site visits to Moody AFB, Georgia and Kirtland AFB, New Mexico. The responses are incorporated in the research findings.

QUESTIONNAIRE #_____

INTERVIEWEE:

POSITION:

JOB:

DATE: TIME:

LOCATION:

1. When did your organization request authorization to assume MCP responsibilities? Were both design and construction agent responsibilities requested?

2. What were the most influential factors leading to your request for MCP authorization? Did you receive any resistance from other organizations?

3. What sections of civil engineering were involved? What type of personnel were used (i.e., temporary overhires, military officers, NCOs, etc.)? What did the organizational structure look like with the MCP program?

4. What management initiatives were necessary to insure a smooth transition from COE management to Air Force management of the MCP (Title II A-E services, Title I, etc.)? Any problems initially?

5. Did management initiatives include additional training? If so, what courses, etc?

6. Is there a better organizational structure for MCP management as compared to your setup? If so, please describe.

7. What impact did your management of MCP projects have on customers/using agencies? On employees? (Pros/cons).

8. What difficulties/conflicts resulted in your management of MCP projects? What difficulties had to be overcome?

9. What organizational problems resulted from Air Force management of MCP projects? (OT, turnovers)?

10. Of all those involved in the MCP, who would you say were the key players, and what role did they play? Who played the lead role?

11. What intangible benefits were accrued from your management of the MCP program?

12. What do you consider your most important contribution to the management of the MCP program?

13. If you had to pick one single factor that contributed the most to your program, what would it be?

14. Do you feel the approach taken was the correct one? Why?

15. How effective was the Air Force managed MCP program in reducing cost when compared to the COE? How were cost savings validated?

16. What areas do you feel benefited the most from the Air Force management of MCP projects? The least?

17. What do you see as the strongest points of the present program? Weakest?

18. How could this program be applied to other Air Force organizations? Air Force projects (non-MCP)?

19. What do you consider as the problem areas in MCP? Did any of these areas improve as a result of your management of the MCP?

20. How can these problems be minimized in addition to Air Force management of MCP? What other changes would you recommend in improving the MCP?

21. How would you rate your organizations effectiveness in management of the MCP? Do you measure the performance of your organization? If so, how?

22. If you were to measure performance, what indicators would you use?

23. How do you gauge customer satisfaction? Employee satisfaction?

Appendix B: Development of a Measurement Model

The following discussion is a detailed description of the procedures used in developing the quantitative measurement model for evaluating MCP programs at various bases.

Development of Effectiveness Measures

As a starting point, a measurement development team was formed. This team consisted of individuals with sufficient knowledge of the target organization and from the following backgrounds: 1) BCE missile engineering branch/ Red Horse, 2) customer representative, 3) BCE design branch, and 4) BCE contract management branch. Total years experience in Base Civil Engineering numbered approximately 25 years.

The team then defined the goals of the measurement activity which represented more of an improvement-oriented type measure. These measures involved areas which the organization was able to control. The following are the objectives of the measurement activity:

1. Help the MCP manager identify improvement-oriented measures of effectiveness over which he/she has control and can periodically monitor.

2. Provide a linkage between specifically identified problems in the MCP management process and the organizational outputs. For the most part, this will involve surrogate measures. As an example, increased professional training does not necessarily guarantee improved quality of work life in an organization, but there is a reasonably good chance that it will. The probability of this correlation is sufficiently high to merit implementing such training although being able to directly track the correlation would be difficult.

Prior to selecting a measurement system for this study, a literature review was conducted on the problem areas in the MCP process, organizational effectiveness theories and measurement models.

Based on the literature review of existing measurement models for government organizations, Tuttle's Method for Generating Efficiency and Effectiveness Measures (MGEEM) appeared to be the most appropriate method. The MGEEM model was selected for measuring performance of MCP organizations for the following reasons:

1. The available information base for the MCP process was obtained by a method similar to the MGEEM. The MGEEM model uses a structured group technique where information is obtained through participation by group members. The available MCP information base was obtained by various authors using surveys, interviews, and site visits. The

advantage of our database was a comprehensiveness otherwise not obtainable. Perceptions from varying levels (e.g., BCE, MAJCOM, AFRCE, users, COE) of all those involved in the MCP process was represented in the subject database.

2. An improvement-oriented approach was required to satisfy the goals of the measurement activity. The MGEEM is primarily an improvement-oriented approach as opposed to control-oriented.

3. MGEEM is a performance-oriented model with emphasis on effectiveness and efficiency. The measurement of effectiveness was of particular relevance to the organizations in this study. The target organization can produce a range of outputs which the manager must choose from in order to produce the most favorable outcomes. The first concern of such an indirect outcome system is whether the selected outputs are correct ones.

4. The MGEEM makes use of the Objective Matrix (Felix and Riggs, 1983) which allows different performance criteria to be aggregated into a single, overall performance index.

5. In the MGEEM process, the organization defines its mission in terms of key results areas (KRAs) and indicators that cover the important facets of performance. This assures only important facets of organizational performance are measured and energy is expended measuring the correct indicators.

Review of the MCP literature served to identify problems in the process with the primary emphasis during the construction phase. This identification of problems resulted in the development of the key result areas (KRAs). The objective in this phase of the measurement activity was to first identify the overall goals for the organization which would serve as management's contribution in solving the present problems. The following are the organizational goals of the MCP organization:

1. Represent and protect the interest of the Air Force, the installation, the civil engineering organization and the end user as it pertains to the Military Construction Program.

2. Provide accurate, timely and complete information to all constituents in a usable format.

3. Provide proper design and construction management for MCP projects to assure compliance of applicable contract documents.

4. Provide an interface between the various organizations involved in the process such as AFRCE, MAJCOM, the contractor, the designer/A-E, and the constituents.

The measurement development team then generated numerous KRAs which were later reviewed and revised so as to remove any redundancies and achieve a high level of specificity. Finally, the KRAs were narrowed down to those which were most appropriate in terms of the organizational

goals. The initial KRA list included 19 items and was eventually reduced to the final 5 KRAs. Quantitative indicators were then compiled for each KRA.

The next step involved a review of the KRAs and indicators by a management team in the field. In this case, the chief of the Contract Management branch and one of the staff engineers of the 2750th ABW/DEEC, Wright-Patterson AFB, participated in this review. The names of the participants in the review were: Mr. Tony Sculimbrene, DEEC branch chief, GM-13 and Ms. Lisa Schertzer, MCP staff engineer, GS-12.

This management review team reviewed each KRA and indicator and recommended whether to delete, modify or retain the item. The team also helped in prioritizing the KRAs and their respective indicators. Basically, the management review served to refine the measurement system developed earlier and also provided a practitioner perspective. The combined years of experience in Base Civil Engineering totaled 19 years for the management review team. Other insights into the MCP process were provided by the review team and are presented below:

1. Project complexity and length were identified as the biggest contributors to the problems in the MCP.

2. Project complexity was defined as the level of technological design and use of specialized equipment. For example, projects involving specialized design and

construction such as advanced weapons laboratories or other research and design (R&D) test facilities. These type of projects would often have unique problems which the contractor would have difficulty dealing with.

3. Project length was a problem due to the complicated process involved in any MCP project. However, many secondary problems would arise during the life of a project due to the various changes in personnel, requirements, regulations and users involved in the project.

4. Project turnover and post-construction follow-up (e.g., 9 and 12 month warranty inspections) were emphasized as being two areas worth allocating time to.

The measurement development team took two specific actions as a result of the information provided. Indicators for project complexity and length were added to differentiate for projects requiring more sophisticated construction and equipment.

The next step in the measurement development involved aggregating and analyzing all the performance indicators using a common denominator. The MGEEM model provided a mechanism for obtaining an overall performance index based on the quantitative information. The objective matrix was sued for this purpose in the following sequence:

1. First, the indicators were defined in terms of a ratio and current period scores were derived from this data. Indicator ratios could be based either on a period of time or a standard (e.g., number of manhours/number of projects).

2. Standard performance levels were defined for the indicators using utility curves developed by the measurement team. These curves allowed the team to convert the score of any particular indicator to a common performance scale from zero to ten.

3. Weights for each indicator were assigned based on importance in terms of their individual contribution to the mission accomplishment.

4. Using the objective matrix, the team established a one month performance period and then obtained the quantitative data for the current month. Using the utility curves, current period scores were derived from the raw data. The current period measurement for a given indicator was located on the x-axis of the utility curve and the current period score was located on the x-axis. Using the appropriate curve, the field measurement would then be matched up with a score from zero to ten which represented the current period equivalent score. This process was repeated for all indicators to obtain the standard scores.

5. To obtain the weighted score, the current period equivalent score was then multiplied by the appropriate weighting factor.

6. Finally, all the final scores for each indicator are summed to obtain the total score for the respective KRAs. The KRAs in turn were summed with their applicable weighting factors to finally obtain a total performance

score for the target organization. This final score can then be used as baseline to compare future scores. The ideal measurement system would consist of a performance period having a moving 12 month average. This time basis would dampen out fluctuations and possibly more accurately identify trends and problem areas.

The measurement model developed in this study was tested with field data from the MCP organization at the 2750th ABW/DEEC. After repeated trial runs with the data available, the case study approach seemed to be more appropriate than the quantitative measurement system developed. However, the indicators developed in the model were still used in the case study in determining which areas to observe and collect data from.

Bibliography

1. "Air Force Design & Construction Programs," The Military Engineer, 514: 186-189 (May-June 1987).

2. "An Air Force Almanac - The U.S.A.F. in Facts and Figures," Air Force Magazine, 71: 79-208 (May 1988).

3. Arin, Captain John. Chief, Civil Engineering Division. Personal Interview. 6008th TACF/EN, Hickam AFB HI, June-August 1988.

4. Astin, Captain Jared A. and Captain Christopher D. Ruff. Determining Managerial Methods of Productivity Measurement within Civil Engineering Design Units. MS Thesis. School of Systems and Logistics, Air Force Institute of Technology (AU), Wright-Patterson AFB OH, September 1984.

5. Baumgartel, Captain Gary P. and Captain Thomas D. Johnson. Productivity Measurement in a Base Level USAF Civil Engineeering Organization. MS Thesis. LSSR 17-79A. School of Systems and Logistics, Air Force Institute of Technology (AU), Wright-Patterson AFB OH, 1979, (AD-A073 017).

6. Benbasat, Izak, David K. Goldstein, and Melissa Mead. "The Case Research Strategy in Studies of Information Systems," MIS Quarterly. Volume 11, Number 3, pp. 369-388, September 1987.

7. Blake, Captain Larry J. and Captain Richard M. Marchbanks. Analysis and Modeling of the Facility Acquisition Process as it Relates to the Development and Deployment of New Weapons Systems. MS Thesis. School of Systems and Logistics, Air Force Institute of Technology (AU), Wright-Patterson AFB OH, September 1985.

8. _____. Class Handout. Distributed in Commander's Engineering and Services Orientation course, School of Engineering and Services, Air Force Institute of Technology (AU), Wright-Patterson AFB OH, February 1988.

9. Bland, John. Staff Architect/Project Manager, MCP Management Office. Personal Interview. 1606th ABW/DEEE-MP, Kirtland AFB NM, July-August 1988.

10. Christman, Colonel Daniel. Commander, Savannah District Corps of Engineers. Memorandum of Understanding. Subject: Model Installation Program. 11 September 1984.

11. "CM and Government Contracting Out: PBCS and ILC (Industry and Liaison Committee) Air Both Sides," The Military Engineer, 74: 372-374 (September-October 1982).

12. Craig, Herbert. Deputy Chief, Contract Management. Personal Interview. 1606th ABW/DEEE-MP, Kirtland AFB NM, July-August 1988.

13. Crenshaw, Carlton. Chief, Environmental and Programming Branch. Personal Interview. 347th TFW/DEEV, Moody AFB GA, May 1988.

14. Department of the Army. Customer Care Survey. Corps of Engineers, Mobile District, Alabama. 1986.

15. Dutcher, Captain Gerald B. An Investigation Concerning Perceptions of Military Construction Program Effectiveness by the AFRCES, the MAJCOM, and the Bases. MS Thesis. School of Systems and Logistics, Air Force Institute of Technology (AU), Wright-Patterson AFB OH, September 1986.

16. Fattor, Captain Steve. Staff Civil Engineer/Project Manager, MCP Management Office. Personal Interview. 1606th ABW/DEEE-MP, Kirtland AFB NM, July 1988.

17. Furman, Wes. Chief, MCP Management Office. Personal Interview. 1606th ABW/DEEE-MP, Kirtland AFB NM, July 1988.

18. _____. Personal Correspondence. 1606th ABW/DEEE-MP, Kirtland AFB NM, undated.

19. Headquarters Air Force Engineering and Services Center. Project Image: Analysis of Engineering Functions. Contract No. F-98635-C-0252. Tyndall AFB FL, October 1986.

20. HQ MAC/DE. "Military Construction Program (MCP) Execution, Kirtland AFB NM." Electronic Message. 261515Z, February 1988.

21. _____. "FY 90 MCP, Design Agent (DA) Designation, Speical Operations Forces (SOF) Projects, Kirtland AFB NM." Electronic Message. 252140Z, April 1988.

22. HQ MAC/DEM. "Assessment of MIP Proposal 84MK0016DE, Design/Construction Agent for MCP Projects." Eletronic Message. 201405Z, May 1987.

23. HQ TAC/DEM. "Model Installation Waiver Request 84TM0005DE - Management of Military Construction Projects." Electronic Message. 102130Z, January 1984.

24. HQ TAC/DEEE. "Model Installation Program - MCP." Electronic Message. 302130Z, March 1984.

25. HQ USAF/PRP. "Model Installation Waiver Request 84TM005DE - Management of Military Construction Projects." Electronic Message. 172030Z, January 1984.

26. _____. "HQ MAC Model Installation Waiver Request 84MK016DE - Management of Military Construction Projects." Electronic Message. 131730Z, February 1984.

27. _____. "Model Installation Program (MIP) Proposals 85PH164, 85MK064, and 85MK078." Electronic Message. 242110Z, September 1986.

28. Jarvis, Barbara C. Program Manager for the Model Installation Program. Personal Inteview. HQ USAF/LEEM, Pentagon, Washington DC, 15 October 1987.

29. Kaneda, Captain Kenneth G. and Captain Robert M. Wallett. Development of Productivity Measures for the Design Section of a Base Level Civil Engineering Organization. MS Thesis. LSSR 16-80. School of Systems and Logistics, Air Force Institute of Technology (AU), Wright-Patterson AFB OH, 1980, (AD-A087 496).

30. Klepper, Lowell. Deputy Base Civil Engineer. Personal Interview. 347th TFW/DED, Moody AFB GA, May 1988.

31. _____. Personal Correspondence. 347th TFW/DED, Moody AFB GA, 12 January 1984

32. _____. Personal Correspondence. 347th TFW/DED, Moody AFB GA, 24 January 1984.

33. Larson, Captain Ruth I. An Analysis of the Programming of Facilities to Support Deployment of Major New Weapon Systems. MS Thesis. School of Systems and Logistics, Air Force Institute of Technology (AU), Wright-Patterson AFB OH, September 1985.

34. Lewis, Arie Y. and John W. Minton. "Determining Organizational Effectiveness: Another Look, and an Agenda for Research," Management Science, Volume 32, Number 5, pp. 514-537 (May 1986).

35. "MCP Management Office Booklet," Engineering, Construction and Development Direcorate, Kirtland AFB NM, 1 January 1985.

36. Mahoney, T. A. and W. Weitzel. "Managerial Models of Organizational Effectiveness," Administrative Science Quarterly, Volume 14, pp. 357-365, 1969.

37. Marcos, Bernard, Jr. A Study of the Perceptions of Roles, Responsibilities, and Problem Areas During Facility Transition in the Military Construction Program. MS Thesis. School of Systems and Logistics, Air Force Institute of Technology (AU), Wright-Patterson AFB OH, September 1987.

38. Meehan, Patrick J. Director of Facility Requirements and Resources. Personal Correspondence. Office of the Assistant Secretary of Defense, Washington DC, 10 June 1985.

39. Montoya, Vince. Staff Civil Engineer, MCP Management Office. Personal Interview. 1606th ABW/DEEE-MP, Kirtland AFB NM, July 1988.

40. Poe, General Bryce and Lieutenant General Devol Brett. "Observations on USAF Construction Programs with Emphasis on U.S. Army Corps of Engineers Involvement." Special Report for the U.S. Army Corps of Engineers. HQ USAF, Washington DC, 6 August 1985.

41. Rumsey, Major Hal A. Assistant Professor of Engineering Management, School of Systems and Logistics. Personal Inteview. Air Force Institute of Technology, Wright-Patteson AFB OH, August 1987-August 1988.

42. Scott, Eugene L. "The Cost Growth Phenomenon," National Contract Management Journal, 16: 37-45, Issue 2, Winter 1983.

43. Sculimbrene, Tony and Lisa Schertzer. Chief of Contract Management and Staff Engineer. Personal Interview. 2750th ABW/DEEC, Wright-Patterson AFB OH, February-March 1987.

44. 1606th ABW/CC. "Model Installation Program Proposal, 84MK016." Electronic Message. 301725Z, January 1984.

45. _____. "MIP Proposal, 85MK0064DE, Waiver to FM 172-1, Vol 1, Use of MCP Funds for Base Personnel Costs." Electronic Message. 192045Z, March 1985.

46. _____. "MCP FY 89 and FY 90 Design Agent." Electronic Message. 041615Z, June 1986.

47. _____. "Military Construction Program (MCP) Execution, Kirtland AFB NM." Electronic Message. 082100Z, March 1988.

48. 1606th ABW/DEE. "FY 90 MCP Design Agent." Electronic Message. 071750Z, March 1988.

49. Steers, Richard M. "When is an Organization Effective? A Process Aprpoach to Understanding Effectiveness," Organizational Dynamics, pp. 50-64 (Autumn 1976).

50. Stollbrink, Captain Michael. A Study of User Involvement in the Military Construction Program Process. MS Thesis. School of Systems and Logistics, Air Force Institute of Technology, Wright-Patterson AFB OH, September 1986.

51. Stone, Eugene F. Research Methods in Organizational Behavior. Glenview IL: Scott, Foresman and Company, 1978.

52. Stone, Robert A. Memorandum for Deputy Assistant Secretary of the Air Force (Installations, Environment and Safety). Subject: Model Installation Program, Request Waiver of DOD Directive 4270.5. 17 January 1984.

53. Sullivan, H. Perry. "ESQ Interviews Robert A. Stone: Master of the MIP," Air Force Engineering and Services Quarterly, Volume 26, Number 5, pp. 8-14 (Winter 1985/1986).

54. Taylor, Captain Edward. Chief, Contract Management. Personal Interview. 347th TFW/DEEC, Moody AFB GA, May 1988.

55. 347th TFW/DEE. "Military Construction Program - A Brief History." Undated.

56. _____. "MIP Initiative for MCP Project Management." 23 February 1984.

57. Tuttle, Thomas C. and Charles N. Weaver. Methodology for Generating Efficiency and Effectiveness Measures (MGEEM): A Guide for Air Force Measurement Facilitators. AFHRL Technical Paper 86-36. November 1986.

58. Whiteman, Captain Neil. Assistant Chief, Contract Management. Personal Interview. 1776th ABW/DEEC, Andrews AFB MD, June-August 1988.

59. Wilson, James. Director of Resource Management. Telephone Interview. AFOTEC/RM, Kirtland AFB NM, 18 August 1988.

60. Wright, Major General (USAF Retired) Clifton D. "Better Design and Construction, A Challenge We Must Meet," The Military Engineer, 491: 15-17 (January-February 1987).

61. Yates, James. Contracting Officer of MCP Management Office. Personal Interview. 347th TFW/DEEM, Moody AFB GA, May 1988.

62. Yenne, Bill. The Air Force Today. New York NY: Gallery Books, 1986.

63. Yin, Robert K. Case Study Research. Applied Social Research Methods Series, Volume 5, 1984.

64. Zammuto, Raymond F. Assessing Organizational Effectiveness. Albany NY: State University of New York Press, 1982.

VITA

Brian H. Sekiguchi [redacted] he attended the University of California in Berkeley, California where in March 1979 he received the Bachelor of Science degree in Civil Engineering. Upon graduation, he returned to Hawaii and worked as a project engineer for Teval Corporation then as a soils and foundations engineer for E. K. Hirata and Associates. In 1980, he worked for E. E. Black, Ltd. as a project manager on the construction of the new Honolulu International Airport control tower.

In September 1981, he was hired by Pearl Harbor Naval Shipyard as a general engineer. In January 1984, he transferred to the Department of the Air Force, Base Civil Engineering organization as a supervisory civil engineer in the contract management branch at Hickam AFB, Hawaii. In June 1987, Mr. Sekiguchi entered the School of Systems and Logistics, Air Force Institute of Technology at Wright-Patterson AFB, Ohio.

[redacted]

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE

REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

1a. REPORT SECURITY CLASSIFICATION UNCLASSIFIED	1b. RESTRICTIVE MARKINGS
2a. SECURITY CLASSIFICATION AUTHORITY	3. DISTRIBUTION/AVAILABILITY OF REPORT Approved for public release; distribution unlimited
2b. DECLASSIFICATION/DOWNGRADING SCHEDULE	
4. PERFORMING ORGANIZATION REPORT NUMBER(S) AFIT/GEM/LSM/88S-18	5. MONITORING ORGANIZATION REPORT NUMBER(S)
6a. NAME OF PERFORMING ORGANIZATION School of Systems and Logistics 6b. OFFICE SYMBOL (If applicable) AFIT/LSM	7a. NAME OF MONITORING ORGANIZATION
6c. ADDRESS (City, State, and ZIP Code) Air Force Institute of Technology Wright-Patterson AFB OH 45433-6583	7b. ADDRESS (City, State, and ZIP Code)
8a. NAME OF FUNDING/SPONSORING ORGANIZATION 8b. OFFICE SYMBOL (If applicable)	9. PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER
8c. ADDRESS (City, State, and ZIP Code)	10. SOURCE OF FUNDING NUMBERS PROGRAM ELEMENT NO. / PROJECT NO. / TASK NO. / WORK UNIT ACCESSION NO.

11. TITLE (Include Security Classification)
EVALUATION OF THE AIR FORCE AS A DESIGN AND CONSTRUCTION AGENT IN THE MILITARY CONSTRUCTION PROGRAM

12. PERSONAL AUTHOR(S)
Brian H. Sekiguchi, B.S.

13a. TYPE OF REPORT	13b. TIME COVERED	14. DATE OF REPORT (Year, Month, Day)	15. PAGE COUNT
MS Thesis	FROM ____ TO ____	1988 September	153

16. SUPPLEMENTARY NOTATION

17. COSATI CODES			18. SUBJECT TERMS (Continue on reverse if necessary and identify by block number)
FIELD	GROUP	SUB-GROUP	
13	02		Military Construction, Construction, THESES.
15	05		Military Procurement,
			Air Force Procurement, (TES)

19. ABSTRACT (Continue on reverse if necessary and identify by block number)

Thesis Chairman: Hal A. Rumsey, Major, USAF
Assoc Prof of Engrg Mgt

Approved for public release IAW AFR 190-1.

WILLIAM A. MAUER 17 Oct 88
Associate Dean
School of Systems and Logistics
Air Force Institute of Technology (AU)
Wright-Patterson AFB OH 45433

20. DISTRIBUTION/AVAILABILITY OF ABSTRACT ☒ UNCLASSIFIED/UNLIMITED ☐ SAME AS RPT. ☐ DTIC USERS	21. ABSTRACT SECURITY CLASSIFICATION UNCLASSIFIED
22a. NAME OF RESPONSIBLE INDIVIDUAL Hal A. Rumsey, Major, USAF	22b. TELEPHONE (Include Area Code) (513) 255-5023 22c. OFFICE SYMBOL AFIT/LSM

DD Form 1473, JUN 86 Previous editions are obsolete.

SECURITY CLASSIFICATION OF THIS PAGE

UNCLASSIFIED

ABSTRACT

This case study examines two Air Force civil engineering organizations managing MCP projects in lieu of the Corps of Engineers. The research findings were based on interviews, on-site reviews and documentation of Moody AFB GA and Kirtland AFB NM.

The results indicated the Air Force MCP programs were more effectively managed than earlier programs by the Corps of Engineers. Cost savings, increased responsiveness to users, improved facility design and architectural compatibility, lower contract modification rates and the ability to incorporate changes more easily to accommodate mission changes were some of the advantages found in the Air Force managed programs.

Some of the key management initiatives responsible for the successful program at both organizations include: establishment of an independent MCP Management Office, collocation of contracting with engineering personnel, hiring of technical expertise, cradle-to-grave project management and the employment of the team concept with a multi-disciplined engineering staff to manage projects.

The Air Force civil engineering organizations used well coordinated management decisions to effectively manage the MCP program. Significant improvements were identified in the following, traditional MCP problem areas: 1) customer satisfaction, 2) reviews/changes, 3) project turnover/ warranty, and 4) quality of work life. The experiences at Kirtland and Moody AFBs showed that with increased involvement of the users and base civil engineering organizations in the MCP program, "pride in ownership" in the facilities constructed also increased. This resulted in a better product--a more functional, well-designed and cost effective facility.